





REPORT
OF
HYDROMETRIC SURVEYS
(STREAM MEASUREMENTS)
FOR
THE CALENDAR YEAR 1916

PREPARED UNDER THE DIRECTION OF
F. H. PETERS, D.L.S., M. Can. Soc. C.E.,
COMMISSIONER OF IRRIGATION
BY
P. M. SAUDER, D.L.S., M. Can. Soc. C.E., Chief Hydrometric Engineer
ASSISTED BY
V. A. NEWHALL, B.A. Sc., and W. H. STOREY,
DIVISIONAL HYDROMETRIC ENGINEERS

PRINTED BY ORDER OF PARLIAMENT



OTTAWA

J. DE LABROQUERIE TACHÉ, PRINTER TO THE KING'S MOST
EXCELLENT MAJESTY

1917

CONTENTS

	PAGE
Introduction.....	7
Scope of Work.....	7
Organization.....	7
Banff district.....	8
Calgary district.....	9
Macleod district.....	9
Cardston district.....	10
Western Cypress Hills district.....	11
Eastern Cypress Hills district.....	12
Maple Creek district.....	13
Saskatoon district.....	14
Edmonton district.....	15
Nordegg district.....	15
Jasper district.....	16
Peace River district.....	16
Special Investigations.....	17
Bench-marks.....	17
Office work.....	17
Future work.....	19
Definitions.....	19
Explanation and use of tables.....	20
Convenient equivalents.....	20
Methods of measuring stream flow.....	24
Methods of determining mean velocity.....	24
Gauging stations.....	25
Low velocity limitations.....	25
Office computations.....	25
Winter records.....	29
Rating current-meters.....	30
Peace River drainage basin.....	31
Athabaska River drainage basin.....	43
North Saskatchewan River drainage basin.....	79
Red Deer River drainage basin.....	136
South Saskatchewan River drainage basin.....	146
Bow River drainage basin.....	153
Little Bow River drainage basin.....	245
Oldman River drainage basin.....	250
Waterton River drainage basin.....	303
Belly River drainage basin.....	315
St. Mary River drainage basin.....	324
Milk River drainage basin.....	357
Pakowki Lake drainage basin.....	373
Sage Creek drainage basin.....	389
Lodge Creek drainage basin.....	392
Battle Creek drainage basin.....	414
Frenchman River drainage basin.....	433
Swiftcurrent Creek drainage basin.....	491
Antelope Lake drainage basin.....	511
Lake of the Narrows drainage basin.....	517
Crane Lake drainage basin.....	521
Hay Lake drainage basin.....	529
Bigstick Lake drainage basin.....	534
Many Island Lake drainage basin.....	547
Ross Creek drainage basin.....	555
Sevenpersons River drainage basin.....	565
Qu'Appelle River drainage basin.....	571
Moosejaw Creek drainage basin.....	574
Souris River drainage basin.....	584
Big Quill Lake drainage basin.....	596
Index.....	599
Corrected table for table on page 120, of 1915 Report, inserted between pages.....	134 and 135
Corrected tables for tables on pages 64, of 1910, and 103, of 1911 Reports, between pages.....	296 and 297
Corrected table for table on page 267, of 1915 Report, between pages.....	322 and 323
Combined table of Historic Summaries at St. Mary River, at International Boundary and Kimball, between pages.....	330 and 331
Corrected tables on pages 425, of 1912 Report, and 383, of 1913 report, between pages.....	574 and 575

ILLUSTRATIONS

DATE.	SUBJECT.	PAGE
1. Roll of Honour.....	Frontispiece	
2. Gauge Height—Discharge, Gauge Height—Mean Velocity and Gauge Height— Area Curves.....		18
3. Diagram showing the Effect of an Ice Cover on the Relation between the Gauge Heights and Discharges.....		26
4. Observations of Gauge Heights with Corresponding Maximum and Minimum Temperatures and the Estimated Daily Discharges for a Winter Period.....		28
5. Falls on Bighorn river near Nordegg, Alberta.....	opp.	82
6. Shelter for automatic gauge on North Saskatchewan river at Wilson's ranch.....	opp.	82
7. View showing ice conditions on Oldman river near Macleod, in February, 1916.....	opp.	288
8. Another view of ice conditions on Oldman river near Macleod, in February, 1916.....	opp.	289
9. View showing ice conditions on Waterton river near Stand Off, in February, 1916.....	opp.	312
10. Another view of ice conditions on Waterton river near Macleod, in February, 1916.....	opp.	312
11. Open chain gauge used on Waterton river near Stand Off.....	opp.	358
12. Bridge used for making gaugings of the North branch of Milk river at Peters' ranch.....	opp.	358
13. View of flood on Qu'Appelle river at Lumsden, in April, 1916.....	opp.	572
14. Another view of flood at Lumsden, in April, 1916.....	opp.	572

To His Excellency, The Duke of Devonshire, K.G., G.C.M.G., etc., etc., Governor-General of the Dominion of Canada.

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to lay before Your Excellency the report of Hydrometric Surveys, for the year 1916.

Respectfully submitted,

W. J. ROCHE,
Minister of the Interior

OTTAWA, May 18, 1917.

REPORT

OF

HYDROMETRIC SURVEYS FOR THE CALENDAR YEAR 1916

By P. M. SAUDER, V. A. NEWHALL and W. H. STOREY

INTRODUCTION

SCOPE OF WORK

The chief features of the stream measurement work are the collection of data relating to the flow of surface waters and a study of the conditions affecting this flow. Information is also collected concerning river profiles, the duration and magnitude of floods, irrigation and water-power development, storage, seepage, etc., which may be of use in hydrometric studies.

This information is obtained by a series of observations at regular gauging stations which are established at suitable points. The selection of sites for these gauging stations and their maintenance depend largely upon the physical features and needs of the locality. If water is to be used for irrigation purposes the summer flow receives special attention; where it is required for power purposes, it becomes necessary to determine the minimum flow; if water is to be stored, information is obtained regarding the maximum flow. In all cases the duration of the different stages of the stream is recorded. Throughout the country gauging stations are maintained for general statistical purposes, to show the conditions existing through long periods. They are also used as primary stations, and their records in connection with short series of measurements will serve as bases for estimating the flow at other points in the drainage basin.

During the open water season of 1916, records were taken at one hundred and seventy-seven (177) regular gauging stations on various streams in Alberta and Saskatchewan and at one hundred and thirty-eight (138) regular gauging stations on irrigation ditches and canals. Winter records which are so valuable for power investigations and municipal water supplies, received special attention and records were secured on almost all the important streams in the two provinces, throughout the year.

ORGANIZATION

The methods of carrying on the investigations were similar to those of previous years. Local residents were engaged to observe the gauge heights at regular stations. These observations were recorded in a book supplied by the department, and at the end of each week the observer copied the week's records on a postal card which he forwarded to the Calgary office by the first convenient mail.

District hydrometric engineers made regular visits to the gauging stations, usually once in every three weeks. On these visits they examined the observer's records, made discharge measurements and collected such information and data as would be of use in making estimates of the daily flow at the station. The results of the discharge measurements and all data collected were forwarded as soon as possible after being completed, to the Calgary office, where all reports are copied on regular forms and filed.

During the winter no records were taken at a number of the gauging stations, which made it possible to reduce the field staff and have each engineer spend some time in the office and assist in the final computations and estimates of run-off. As far as possible the same engineer that did the field work made or checked the office computations, so as to eliminate any chance of error through lack of knowledge of the conditions at the gauging station.

Gauge height—area, gauge height—mean velocity and gauge height—discharge curves were plotted and rating tables constructed. Tables of discharge measurements, daily gauge height and discharge, and monthly discharge were also compiled. These records have been collected and are embodied in this, the Eighth Annual Report of the Hydrometric Survey.

At the beginning of 1916 the organization of the staff under the chief hydrometric engineer was changed, and the whole territory and work was divided into two divisions, namely, Northern and Southern. An engineer, designated the Divisional Hydrometric Engineer, was placed in charge of each division and was given a staff consisting of one field engineer for each district in his division, an office engineer and a recorder. This increased the office staff and made it possible for the divisional engineers to spend considerable time in the field and exercise better supervision over the work. This is particularly necessary at the present time, when as a result of enlistments, there are so many new and very often inexperienced engineers employed.

During 1916, the Southern Division included the Macleod, Cardston, West Cypress Hills, East Cypress Hills, Maple Creek and Saskatoon districts, while the Northern Division included the Banff, Calgary, Nordegg, Edmonton, Jasper and Peace River districts.

In each district there was one engineer who, while in the field, employed temporary assistance and was equipped with the necessary gauging and surveying instruments. In Macleod, Saskatoon, Banff, Calgary, Edmonton, Jasper and Peace River districts, the engineers travelled by train and hired livery, while in the Cardston, West Cypress Hills, East Cypress Hills and Maple Creek districts they were supplied with horses and democrats. The engineer in the Nordegg district was supplied with a pack train.

During the early spring extra assistance was requisitioned from the Irrigation Administration staff to assist in collecting records of the early spring run-off in the Cypress hills. Extra assistance was also obtained in the same manner during the high-water period in Southern Alberta, in June.

BANFF DISTRICT

This district included the following regular gauging stations:

Stream	Location	Date Established
Bath creek	NE. 32-28-16-5	April 9, 1913
Bow river	SE. 28-28-16-5a	July 18, 1910
Bow river	SE. 35-25-12-5	May 25, 1909
Bow river	NW. 32-24-8-5	March 10, 1912
Bow river	SE. 2-21-19-4b	August 20, 1909
Cascade river	SE. 19-26-11-5	August 16, 1911
East Br. Canadian Pacific Railway Canal	SE. 3-21-18-4	June 6, 1914
North Br. Canadian Pacific Railway Canal	NW. 3-21-18-4	June 6, 1914
Elbow river	NW. 12-23-5-5	Sept. 29, 1914
Fortymile creek	SW. 2-26-12-5	July 31, 1912
Ghost river	NE. 23-26-6-5	August 17, 1911
Jumpingpound creek	SE. 30-24-4-5	May 7, 1908
Kananaskis river	SW. 34-24-8-5c	August 31, 1911
Louise creek	NE. 20-28-16-5	July 5, 1913
Pipestone river	SW. 27-28-16-5	August 31, 1911
Red Deer river	NW. 11-29-20-4	October 25, 1915
Spray creek	SW. 32-22-10-5	July 24, 1914
Spray river	SE. 31-22-10-5	July 23, 1914
Spray river	SW. 25-25-12-5	July 15, 1910

Records have been obtained throughout the year on all the above stations excepting those on Spray river (SE. 32-22-10-5) and Spray creek, where observers were not available during the winter months, and on Jumpingpound creek, where only open water records were desired.

Miscellaneous gaugings were made of Beapre creek (SE. 15-26-5-5), Big Hill creek (SW. 10-26-4-5), Grand Valley creek (SW. 24-26-5-5), Horse creek (NE. 8-26-4-5), Spencer creek (SE. 18-26-5-5), and the tail-race of Lake Louise power house.

Floods of unusual size occurred on all streams west of Seebe during June, in 1916, but no very great damage was done. During the danger period flood prediction stations were maintained on Bow river at Banff and Cochrane. The observers at these stations telephoned or telegraphed the gauge heights to the office once or twice a day, and when these reports showed the danger of flood on the lower reaches of the river, a warning was sent out to public officials in the locality threatened by floods.

H. C. Ritchie, A.M. Can. Soc. C.E., was in charge of this district during 1916. He was relieved in the field for a short period by W. K. Broughton, and was assisted with the final computations by A. B. Cook.

a This station was originally located on NE. 28-28-16-5, but was moved to its present position on August 31, 1911.

b This station was originally located at Sec. 13-21-19-4, but was moved to its present position in May, 1913.

c This station was originally located on NW. 32-24-8-5, but was moved to its present position on May 13, 1913.

SESSIONAL PAPER No. 25B

CALGARY DISTRICT

This district included the following regular gauging stations:

Stream	Location	Date Established
Bow river	NE. 15-24-1-5a	Nov. 25, 1910
Canadian Pacific Railway Company Canal	NE. 21-23-29-4b	May 18, 1911
Elbow river	SW. 14-24-1-5	May 8, 1908
Nose creek	SW. 35-24-1-5c	April 24, 1911

Winter records were obtained on the Bow and Elbow rivers, and these stations with certain other stations in the vicinity of Red Deer and Rocky Mountain House made up the Calgary winter district.

This district also included the current-meter rating station. The rating tank was filled about April 3, and drained for the winter about November 8.

During the season 69 current-meters, made up as follows, were rated:

Irrigation Branch	45
British Columbia Hydrometric Survey	10
Manitoba Hydrometric Survey	9
Department of Natural Resources, Canadian Pacific Railway Company	3
Shawinigan Water & Power Company, Montreal, P.Q.	2
TOTAL	69

O. H. Hoover, B.A.Sc., and S. H. Frame were in charge of the field work during the winter of 1916, and W. K. Broughton during the summer. Mr. Broughton also made the computations for the current-meter ratings, but the final computations for the gauging stations were made by A. B. Cook and C. S. Dewis.

MACLEOD DISTRICT

This district included the following regular gauging stations:

Stream	Location	Date Established
Allison creek	SW. 11-8-5-5	July 23, 1913
Canyon creek	NE. 14-6-2-5	July 6, 1910
Carbondale river	SE. 15-6-3-5	April 19, 1916
Castle river	SW. 30-6-2-5	April 18, 1916
Castle river	SW. 2-7-1-5	August 5, 1909
Connelly creek	SE. 36-7-2-5	July 31, 1909
Cow creek	NE. 14-8-2-5	May 26, 1910
Crowsnest river	SW. 12-8-5-5	July 28, 1910
Crowsnest river	NE. 36-7-4-5	July 28, 1910
Crowsnest river	NE. 26-7-2-5	Sept. 7, 1907
Elton ditch	NE. 19-8-1-5	July 10, 1912
Findlay & McDougall ditch	SW. 31-18-29-4	June 17, 1911
Fish creek	SW. 26-22-3-5	May 13, 1907
Highwood river	SE. 20-18-2-5	July 27, 1912
Highwood river	NW. 17-20-28-4	October 3, 1911
Huff ditch	NW. 30-8-1-5	July 11, 1912
Little Bow ditch	SE. 6-19-28-4	August 1, 1910
McGillivray creek	SE. 7-8-4-5	July 23, 1913
Mill creek	SW. 18-6-1-5	July 7, 1910
Mosquito creek	NE. 30-16-28-4	August 1, 1908
Muddypound creek	SW. 27-11-28-4	July 27, 1908
Nanton creek	SE. 19-16-28-4d	August 3, 1908
Oldman river	NE. 34-7-1-5	Sept. 15, 1908
Oldman river	NW. 10-9-26-4	July 12, 1910
Oldman river	NW. 1-9-22-4	August 31, 1911
Pekisko creek	NW. 8-17-2-5	October 6, 1911
Pincher creek	SW. 23-6-30-4	August 13, 1906
N. B. Sheep river	SW. 12-21-3-5	May 22, 1908

a A station was maintained on SE. 12-24-1-5, from May 5, 1908, to October 21, 1910.

b During 1908, 1909 and 1910 records were taken at a station on road allowance east of Sec. 36-23-1-5.

c This station was originally located on NW. 13-24-1-5, but was moved to its present position on May 3, 1916.

d This station was originally located on the NW. 20-16-28-4, but was moved to its present position on May 1, 1913.

Stream	Location	Date Established
S. B. Sheep river	SW. 17-20-2-5	May 23, 1908
Sheep river	NW. 22-20-29-4	May 25, 1908
Stimson creek	NW. 2-17-2-5 ^a	October 6, 1911
St. Mary river	NE. 26-7-22-4	October 13, 1911
Todd creek	SW. 19-8-1-5	August 3, 1909
Trout creek	SE. 32-11-28-4	July 7, 1911
Willow creek	NE. 20-9-26-4	August 13, 1915

Miscellaneous gaugings were made of Bellevue creek (NE. 29-7-3-5), Blairmore creek (SE. 10-8-4-5), Drumm creek (NW. 18-7-3-5), Gold creek (NE. 30-7-3-5), Lyons creek (SE. 35-7-4-5), Nez Percé creek (NW. 17-8-4-5) and York creek (NW. 34-7-4-5).

Winter records were obtained on Castle river (lower station), Crowsnest river (three stations), Oldman river (three stations), St. Mary river, Highwood river (two stations), Sheep river, and most of the creeks shown in the miscellaneous list. The Oldman river (NW. 1-9-22-4) and St. Mary river were added to the Cardston district, while the South Saskatchewan river (NW. 31-12-5-4) was added to the Macleod district during the winter months. All other stations were discontinued during the winter.

Stevens Continuous Water Stage Records were used during open water in 1916 on the Oldman river near Macleod and the St. Mary river near Lethbridge.

The field work in this district was in charge of W. R. McCaffrey, B.A.Sc., H. W. Rowley, B.Sc., J. M. Paul, B.E., and W. M. Edwards, B.A.Sc., for various periods, and V. A. Newhall, B.A.Sc., J. R. Estey, B.Sc., A. L. Tregillus and W. S. J. Miller made the final computations for this report.

CARDSTON DISTRICT

This district included the following regular gauging stations:

Stream	Location	Date Established
Alberta Railway and Irrigation Company canal	SE. 36-1-25-4	April 27, 1915
Alberta Railway and Irrigation Company canal	SE. 21-2-24-4	July 26, 1910
Alberta Railway and Irrigation Company canal	NW. 28-4-23-4	May 1, 1914
Belly River	NE. 5-2-28-4	Nov. 1, 1911
Belly river	SE. 21-6-25-4	May 27, 1909
Boundary creek	NW. 20-1-26-4	June 18, 1913
Cameron creek	SW. 23-1-30-4	Jan. 2, 1916
Christianson ditch	SE. 12-3-28-4	Sept. 14, 1911
Crooked creek	SW. 22-2-29-4 ^b	Sept. 15, 1909
Etzikom coulee	SW. 3-7-19-4	April 16, 1914
Etzikom coulee	SW. 2-5-13-4	May 28, 1915
Fidler ditch	SE. 19-1-26-4	Sept. 13, 1911
Lee creek	SE. 27-2-26-4 ^c	May 5, 1913
Mami creek	SE. 19-2-27-4	August 13, 1909
N.B. Milk river	NE. 11-1-23-4 ^d	July 21, 1909
S.B. Milk river	SW. 29-37N-9W.P.M. Montana, U.S.A.	By U.S.G.S. in 1905
Milk river	NE. 21-2-16-4	May 18, 1909
Pinepound creek	NE. 29-4-23-4	April 30, 1914
Pothole creek	NE. 1-6-22-4	April 28, 1914
Pothole creek	NW. 10-5-22-4	April 27, 1914
Rolph creek	SE. 21-2-24-4	May 17, 1911
St. Mary river	NW. 25-1-25-4	By A.R. and I. Co. in 1905
Waterton river	NE. 8-2-29-4	August 26, 1908
Waterton river	NW. 28-6-25-4	Nov. 5, 1915

Miscellaneous gaugings were made of Blakiston brook (SE. 36-1-30-4) and Crooked creek (SW. 16-2-29-4).

Winter observations were made on Belly river (two stations), Blakiston brook, Cameron creek, Lee creek, Milk river, North and South Branches of Milk river, St. Mary river and Waterton river (two stations). In addition the winter district included Oldman river (NW. 1-9-22-4) and St. Mary river (NE. 26-7-22-4).

^a This station was moved on July 4, 1912, to the NW. 2-17-2-5, but was moved to its present position on April 4, 1916.

^b This station was originally located on the SE. 22-2-29-4, but was moved to the SW. 23-2-29-4 on June 15, 1911, and to its present position on October 15, 1912.

^c A station was maintained on the NW. 10-3-25-4 from June 28, 1909, to July 13, 1914.

^d This station was originally located on the NE. 13-1-23-4, but was moved to its present position on May 1, 1913.

SESSIONAL PAPER No. 25b

The stations on St. Mary (NW. 25-1-25-4) and North and South Branches of Milk river are equipped with automatic gauges and are maintained jointly by this branch with the Water Resources Branch of the United States Geological Survey.

V. A. Newhall, B.A.Sc., S. H. Frame, A.M. Can. Soc. C.E., and H. W. Rowley, B.Sc., were in charge of this district for various periods. The final computations for this report were made by S. H. Frame and E. J. Switzer.

WESTERN CYPRESS HILLS DISTRICT

This district included the following regular gauging stations:

Stream	Location	Date Established
Anderson ditch	SW. 23-6-3-4	Sept. 23, 1911
Battle creek	NE. 33-5-29-3	June 3, 1909
Battle creek	NW. 33-5-27-3a	July 5, 1910
Battle creek	NE. 3-3-27-3	May 11, 1910
H. T. Clark ditches	SW. 21-7-3-4	Sept. 28, 1915
Cheeseman ditches	SW. 12-8-29-3	June 24, 1911
English ditch	SW. 12-7-3-4	Sept. 29, 1915
Gaff ditch	SW. 25-5-29-3	July 11, 1911
Irrigation creek	SE. 35-5-7-4	March 21, 1911
Gilchrist ditch	SW. 11-5-27-3	October 16, 1911
Gregg ditch	NE. 34-3-29-3	July 30, 1915
D. A. Hammond ditch	NE. 5-2-29-3	August 2, 1915
Hanckel ditch	NE. 30-7-3-4	October 4, 1915
Hartt ditch	NE. 15-6-3-4	Sept. 27, 1915
Henry ditch	NW. 28-5-28-3	July 7, 1914
Henry ditch	NW. 34-5-28-3	July 7, 1914
Hooper and Huckvale North ditch	SW. 27-4-6-4	May 2, 1912
Hooper and Huckvale South ditch	NE. 22-4-6-4	March 7, 1914
Jahn ditch	SE. 8-3-29-3	July 31, 1915
Ketchum creek	NE. 25-4-7-4	May 17, 1915
Lindner ditch	NW. 10-6-29-3	July 26, 1910
Link ditches	SW. 32-5-1-4	July 25, 1914
Lodge creek	SE. 12-1-29-3	August 13, 1909
E. Br. Lodge creek	SE. 1-7-3-4	October 7, 1911
Lynch ditch	NE. 19-2-29-3	August 9, 1915
Manyberries creek	SW. 27-4-6-4b	June 7, 1910
Maple Creek Cattle Co. ditch	NE. 20-6-27-3	June 27, 1916
Marshall & Gaff ditch	NE. 33-5-29-3	July 11, 1911
McCann ditch	NE. 29-5-1-4	July 13, 1915
McKinnon ditch	NW. 20-4-26-3	October 20, 1911
Middle creek	SW. 30-5-29-3	July 20, 1909
Middle creek	NE. 4-2-29-3	June 13, 1910
Milk river	NE. 6-37N-9E.P.M. Montana, U.S.A.c	August 7, 1909
Mitchell Upper ditch	NE. 29-5-2-4	July 6, 1915
Mitchell Lower ditch	SE. 15-5-2-4	July 7, 1915
Mock ditch	NW. 21-7-2-4	Sept. 29, 1915
Muir & Frantzen ditch	SW. 36-5-2-4	July 6, 1915
Mudie ditch	NW. 21-7-3-4	Sept. 28, 1915
Mull ditches	NW. 24-7-29-3	June 9, 1915
Oxarart creek	NE. 20-6-27-3	June 15, 1909
Parsonage ditch	SW. 3-7-29-3	June 9, 1915
Peachey ditch	SE. 4-3-29-3	July 29, 1915
Read ditch from Michel coulee	NE. 33-6-3-4	Sept. 28, 1915
Read ditch from Read creek	NE. 34-6-3-4	Sept. 27, 1915
Richardson ditch	SE. 2-5-27-3	October 14, 1911
Sage creek	NE. 9-1-2-4	August 10, 1909
Sixmile coulee	SW. 6-7-28-3d	July 22, 1909
Spangler ditch	NW. 24-2-30-3	August 2, 1915
Spangler ditch	SW. 6-7-28-3	July 10, 1911
Stirling and Nash ditch	SE. 22-3-27-3	July 11, 1911
Suiste North ditch	NE. 9-6-3-4	Sept. 27, 1915
Suiste South ditch	NE. 4-6-3-4	Sept. 27, 1915
Wiley ditches	SW. 3-1-2-4	August 11, 1915

a This station was originally located on the SW. 2-6-28-3, but was moved to its present position on May 29, 1912.

b This station was originally located on the SE. 3-5-6-4, but was moved to its present position on May 2, 1912.

c This station was originally located on SE. 3-1-5-4, but was moved to its present position in the spring of 1913.

d This station was originally located on the NW. 29-7-28-3, but was moved to its present position on July 4, 1911.

7 GEORGE V. A. 1917

Stream	Location	Date Established
Wilkes ditch.....	NW. 4-6-27-3	October 7, 1915
Wilson ditch.....	NE. 34-5-28-3	June 21, 1911
Wood and Anderson ditch.....	NE. 21-7-29-3	June 20, 1914
Wood and Anderson East ditch.....	SE. 22-7-29-3	June 20, 1914
Wood and Anderson West ditch.....	NE. 22-7-29-3	June 20, 1914

As the rainfall was above the average, several of the ditches were used very little, or not at all, during 1916.

During the fall a new gauging station, with an automatic gauge, was established on Battle creek near the international boundary. It was constructed and will be maintained, jointly by this Branch and the United States Geological Survey.

No winter records were obtained on any of the streams in this district during 1916.

Miscellaneous gaugings were made of Bare creek (SW. 25-3-1-4), Canal creek (SW. 27-3-6-4), Kennedy coulee (NE. 6-37N-9E.P.M., Mont., U.S.A.), Lodge creek (NW. 10-6-3-4, SW. 15-6-3-4, and NE. 25-3-1-4), Lost river (Sec. 2-1-4-4), S. B. Manyberries creek (SW. 7-5-5-4), Middle creek (SW. 35-5-1-4), Sexton creek (SW. 21-7-3-4), Sixmile creek (Sec. 12-8-29-3), and Tennmile creek (Sec. 4-6-29-3).

Most of the flow of the streams in this district takes place in the early spring, during the break up, and the district was covered during this period by three engineers. W. H. Rowley, B.Sc., was in charge of the work on the lower stations on Battle and Willow creeks; P. A. Fetterley, B.Sc., in charge of the work on the upper waters of Battle and Lodge creeks; and L. J. Gleeson, B.Sc., in charge of the work in the vicinity of Pakowki lake and Milk river at Spencer's lower ranch. After the end of the freshet period, Mr. Rowley was in charge of the whole district and he and J. R. Estey, B.Sc., made the final computations for this report.

Mr. Rowley also acted as Water-master in this district, but owing to the abundance of rainfall his duties as Water-master were very light.

EASTERN CYPRESS HILLS DISTRICT

This district included the following regular gauging stations:

Stream	Location	Date Established
Armstrong East ditch.....	SW. 9-8-24-3	October 15, 1913
Armstrong West ditch.....	SW. 9-8-24-3	October 15, 1913
Axton ditch.....	SE. 26-7-21-3	July 26, 1913
Axton North ditch.....	NE. 23-7-21-3	July 26, 1913
Axton South ditch.....	NE. 23-7-21-3	July 26, 1916
Barnett ditch.....	SE. 17-7-22-3	July 26, 1915
Barroby ditch.....	NE. 33-6-23-3	August 12, 1913
Bate creek.....	SW. 7-6-16-3	April 15, 1914
Bate ditches.....	SW. 7-6-16-3	July 28, 1913
Belanger creek.....	NE. 19-6-25-3a	March 31, 1912
Bigbreed creek.....	NW. 3-2-11-3b	March 30, 1914
Bolingbroke ditch.....	NE. 7-7-22-3	August 11, 1913
Bone creek.....	NW. 34-8-22-3	July 2, 1908
Bowrey ditch.....	near Barnard, Mont., U.S.A.	April 30, 1914
Clark and Thompson ditch.....	NE. 5-7-21-3	July 19, 1913
A. M. Cross ditch.....	SE. 5-8-22-3	August 14, 1913
F. Cross ditch.....	NW. 15-7-22-3	Sept. 9, 1911
Davis creek.....	NE. 29-6-25-3	May 24, 1909
Drury ditch.....	NW. 19-6-25-3	Sept. 2, 1914
Fairwell creek.....	NW. 30-6-24-3	June 10, 1909
Frenchman river.....	NE. 23-6-23-3	July 9, 1912
Frenchman river.....	SE. 31-6-21-3c	July 31, 1908
Frenchman river.....	SE. 27-5-16-3	April 10, 1914
Frenchman river.....	NW. 24-1-11-3d	March 27, 1914
N.B. Frenchman river.....	NE. 16-7-22-3	July 25, 1908
Horse creek.....	near Barnard, Mont., U.S.A.	May 1, 1914
Jones creek.....	SE. 20-8-20-3e	May 15, 1912

a This station was originally located on the SW. 30-6-25-3, but was moved to its present position on August 7, 1915.

b This station was originally located on the SE. 15-2-11-3, but was moved to its present position on April 20, 1915.

c This station was originally located on the NE. 31-6-21-3, but was moved to its present position on August

21, 1914.

d This station was originally located on the NW. 3-2-11-3, but was moved to its present position on September

22, 1915.

e A station on this stream was previous to 1912 maintained on Sec. 5-8-20-3.

SESSIONAL PAPER No. 25B

Stream	Location	Date Established
Kearney ditch.....	SE. 19-8-23-3	Sept. 6, 1913
Lewis ditch.....	NW. 34-8-22-3	July 29, 1915
Littlebreed creek.....	NW. 11-2-11-3	March 28, 1914
McEachran creek.....	SW. 6-1-7-3	May 1, 1914
Morrison ditch.....	SW. 26-6-21-3	August 22, 1911
Mule creek.....	SW. 33-5-17-3	April 15, 1914
Parker ditches.....	SW. 4-9-20-3	July 15, 1913
D. H. Pollock ditches.....	NW. 22-7-21-3	August 10, 1911
Rock creek.....	near Barnard, Mont., U.S.A.	April 30, 1914
Snake creek.....	SW. 16-4-13-3	April 7, 1914
C. E. Stearns ditch.....	NW. 20-8-20-3	July 16, 1913
C. E. Stearns ditch.....	SW. 20-8-20-3	July 16, 1913
C. E. Stearns ditch.....	SW. 17-8-20-3	July 16, 1913
Stearns Bros. South ditch.....	SW. 9-9-20-3	July 21, 1915
Stearns Bros. North ditch.....	SW. 9-9-20-3	July 21, 1915
Strong ditch.....	NE. 25-6-22-3a	July 31, 1908
Sucker creek.....	NW. 24-6-26-3	May 26, 1909
Swiftcurrent creek.....	SW. 22-7-21-3	May 18, 1909
F. T. White ditch.....	SW. 12-9-22-3	July 25, 1913

Miscellaneous gaugings were made of Blacktail creek (NW. 20-6-23-3), Buzzard's ditch (NW. 11-2-11-3), Calf creek (SE. 5-8-22-3), Concrete coulee (NW. 2-7-23-3), Doyle coulee (SW. 17-7-22-3), Fireguard creek (SE. 5-3-11-3), Petrified coulee (SE. 18-7-22-3), Little Pinto creek (SE. 2-4-12-3), Police creek (SW. 30-3-11-3), Rose creek (NE. 26-7-22-3), Shotgun creek (NW. 21-4-14-3) and E. B. Snake creek (NW. 21-4-12-3).

No records of winter flow were taken in this district.

As the rainfall was a little above the average, several of the ditches were used very little, or not at all, during 1916.

Late in the fall a new station, with an automatic gauge, was established on Frenchman river near the international boundary. It was constructed, and will be maintained, jointly by this branch and the Water Resources Branch of the United States Geological Survey.

J. E. Caughey, B.Sc., had charge of the field work in this district until August 30, when he was granted leave of absence to enlist for active service overseas. M. H. French assisted during the spring break-up. After Mr. Caughey left, L. B. P. Miles was in charge of the field work for the balance of the year. The final computations for this report were, however, made by J. R. Estey, B.Sc., E. J. Switzer and H. W. Rowley, B.Sc.

MAPLE CREEK DISTRICT

This district included the following regular gauging stations:

Stream	Location	Date Established
Adams ditches.....	NE. 10-9-27-3	May 22, 1914
Bear creek.....	SE. 18-11-23-3	June 22, 1908
Beveridge East ditch.....	NE. 7-10-24-3	May 24, 1915
Beveridge West ditch.....	NW. 18-10-24-3	June 27, 1914
Boxelder creek.....	NE. 2-12-30-3	May 24, 1909
Braniff ditch.....	SE. 30-11-23-3	June 22, 1911
Bridge creek.....	SE. 33-10-22-3	April 8, 1911
Bridge creek.....	SE. 23-13-19-3	March 29, 1911
Brown ditch.....	NW. 31-8-3-4	October 14, 1915
Bullshead creek.....	SW. 4-11-5-4	May 15, 1915
Bullshead creek.....	SE. 16-12-5-4	July 26, 1909
Clark ditch.....	SE. 15-9-5-4	October 15, 1915
Cumberland ditch.....	SW. 17-11-24-3	June 27, 1914
Dimmock ditch.....	SE. 16-11-21-3	July 29, 1912
Dimmock ditch.....	SW. 33-11-21-3	July 4, 1915
Dixon ditch.....	SE. 17-12-26-3	June 4, 1911
D. Drinnan ditches.....	SE. 23-13-1-4	Nov. 11, 1915
J. K. Drinnan ditches.....	NE. 7-12-3-4	Nov. 6, 1915
Fauquier ditch.....	NE. 30-10-25-3	June 8, 1914
Fearon ditch.....	SW. 6-11-24-3	June 25, 1912
Gap creek.....	SE. 4-10-27-3	April 25, 1909
Gordon, Ironside & Fares ditch.....	NW. 7-12-22-3	June 14, 1915
Green ditch.....	SE. 17-14-14-3	July 2, 1915

a This station was originally located on Sec. 36-6-22-3, but was moved to its present position on April 17, 1911.

Stream	Location	Date Established	
Hammond ditches	SW. 16-10-25-3	May	26, 1915
Hargrave ditch	SW. 36-12-30-3	Nov.	12, 1915
Hargrave ditch	NE. 25-12-1-4	Nov.	12, 1915
Hargrave ditch	NW. 1-13-1-4	Nov.	12, 1915
Hawkins ditch	SE. 26-9-20-3	July	9, 1913
Hay creek	SW. 29-10-25-3	July	4, 1910
MacKay creek	NW. 26-11-1-4	July	29, 1909
Mann ditch	NW. 32-10-22-3	July	1, 1915
Many Island Sheep Company ditches	NE. 11-13-1-4	Nov.	12, 1915
Maple creek	SE. 28-11-26-3	May	4, 1910
Maple creek	NE. 5-12-26-3	April	28, 1915
Martin ditch	NE. 5-11-28-3	Nov.	16, 1915
McCarthy, Bertram & Salt ditches	NW. 29-11-23-3	June	15, 1914
Moorhead ditch	SE. 25-10-25-3	June	10, 1911
Needham ditch	SW. 30-11-23-3	June	22, 1911
Notukeu creek	NW. 10-11-10-3	August	6, 1914
Peacock ditches	SW. 36-10-26-3	May	19, 1915
Piapot creek	NE. 18-11-24-3a	June	17, 1908
Pollock ditches	SW. 17-9-27-3	May	19, 1914
Rae ditch	NE. 24-13-6-4	October	23, 1915
Ross creek	NW. 31-11-2-4	July	28, 1909
Sevenpersons river	NE. 30-12-5-4	April	27, 1911
Sinclair ditch	SE. 18-10-19-3	July	22, 1915
Skull creek	SE. 32-10-22-3	April	8, 1911
Small ditch	NW. 26-9-28-3	Nov.	22, 1915
Small ditch	SE. 22-9-27-3	Nov.	22, 1915
South Saskatchewan river	NW. 31-12-5-4	May	31, 1911
Starks & Burton ditch	SE. 17-11-5-4	October	9, 1911
Swiftcurrent creek	NE. 18-10-19-3	June	15, 1910
Swiftcurrent creek	NW. 17-10-19-3	May	27, 1910
Swiftcurrent creek	SW. 12-15-14-3	Jan.	16, 1914
Swiftcurrent creek	NW. 18-15-13-3b	April	30, 1910
Tranter North ditch	SW. 18-10-24-3	May	20, 1915
Tranter South ditch	NW. 5-10-24-3	May	20, 1915

Miscellaneous gaugings were made of E. B. Bear creek (NE. 29-10-23-3), W. B. Bear creek (NW. 29-10-23-3), Gap creek (NE. 28-11-26-3 and SE. 30-11-26-3), E. B. Mackay creek (NW. 14-11-1-4), W. B. Mackay creek (NW. 14-11-1-4), McShane creek (SE. 4-10-27-3), Piapot creek (SE. 25-10-25-3 and SE. 36-10-25-3), and Spring coulee (SE. 8-11-23-3).

No winter records were taken, except of the South Saskatchewan river, Swiftcurrent creek (two stations) and Notukeu creek. The first mentioned was included in the Macleod district during the winter and the two latter in the Saskatoon district.

As the rainfall was a little above the average, several of the ditches were not used at all during 1916.

E. J. Switzer was in charge of this district during 1916. He was assisted in the final computations for this report by J. R. Estey, B.Sc.

SASKATOON DISTRICT

This district included the following regular gauging stations:

Stream	Location	Date Established	
Battle river	NW. 25-43-17-3c	May	23, 1914
Long creek	SE. 10-2-8-2	June	22, 1911
Moosejaw creek	NE. 24-11-19-2	June	21, 1911
Moosejaw creek	NW. 16-16-26-2	April	7, 1910
Moose Mountain creek	NE. 15-3-2-2	Sept.	4, 1913
North Saskatchewan river	SW. 33 and NE. 29-43-16-3	May	16, 1911
North Saskatchewan river	River Lot 76, Prince Albert Settlement	October	2, 1911
Qu'Appelle river	NW. 33-19-21-2	May	12, 1911

a This station was originally located on the SW. 17-11-24-3, but was moved to its present position on May 13, 1909.

b This station was originally located on the SW. 30-15-13-3, but was moved to its present position on May 5, 1913.

c A station was previously maintained on this stream on the SE. 19-43-17-3.

SESSIONAL PAPER No. 25B

Stream	Location	Date Established
Souris river.....	SE. 20-8-14-2	May 17, 1916
Souris river.....	NE. 11-2-8-2	June 23, 1911
Souris river.....	NE. 36-2-1-2	June 26, 1911
South Saskatchewan river.....	SW. 28-36-5-3	May 27, 1911
Spring creek.....	SE. 30-32-15-2	August 1, 1916
Springs.....	NE. 17-17-28-2	August 17, 1916
Spruce river.....	SW. 26-49-26-2	July 14, 1915

Winter records were obtained on all the regular stations in this district, except one station on Moosejaw creek (NE. 24-11-19-2), Moose Mountain creek and Souris river (NE. 36-2-1-2). Two gauging stations on Swiftcurrent creek, near Swift Current, and Notukeu creek at Vanguard, were included in this district during November and December.

F. R. Shenstone, B.E., was in charge of the field work in this district, except for about six weeks, when he was relieved by J. R. Estey. The final computations for this report were made by F. R. Shenstone, B.E., J. R. Estey, B.Sc., V. A. Newhall, B.A.Sc., W. E. G. Hall, B.Sc., and C. S. Dewis.

EDMONTON DISTRICT

This district included the following regular gauging stations:

Stream	Location	Date Established
Athabaska river.....	SE. 20-66-22-4	Feb. 27, 1913
Battle river.....	SW. 4-43-25-4	May 7, 1913
Blindman river.....	NE. 16-39-27-4	July 1, 1914
Clearwater river.....	SE. 16-39-7-5	June 3, 1913
Hastings creek.....	SE. 23-51-20-4	April 28, 1916
North Saskatchewan river.....	NE. 21-39-7-5	June 2, 1913
North Saskatchewan river.....	River Lot No. 17, Edmonton Settlement, NW. 33-52-24-4	May 1, 1911
Pigeon creek.....	SE. 15-46-28-4	July 13, 1914
Red Deer river.....	SE. 20-38-27-4	Dec. 2, 1911
Sturgeon river.....	Bet. River Lots 27 and 52, St. Albert Settlement	April 23, 1913
Sturgeon river.....	NW. 28-55-22-4	Dec. 30, 1913

All stations in this district were maintained throughout the winter, except Pigeon creek and Sturgeon river at St. Albert. The district was, however, divided and included in the Peace River, Jasper and Calgary districts during the winter.

Flood prediction stations were maintained on the North Saskatchewan river at Rocky Mountain House and Edmonton. The observers at these stations telegraphed the gauge height to the office once or twice a day, and when these reports showed the danger of a flood on the lower reaches of the river, a warning was sent out to public officials in the locality threatened by floods. The river did not get nearly so high in 1916 as in 1915 and no great damage was done. The daily reports, however, removed any undue alarm caused by unreliable reports.

C. M. O'Neil, B.A.Sc., was in charge of this district until May 16, when H. S. Kerby, B.A.Sc., was placed in charge. On September 20, Mr. Kerby was granted leave of absence to go on active service overseas, and the Edmonton district was divided and included in the Calgary, Jasper and Peace River districts. C. S. Dewis and W. H. Storey made the final computations for the annual report.

NORDEGG DISTRICT

This district included the following regular gauging stations:

Stream	Location	Date Established
Bighorn river.....	Sec. 18-39-16-5	June 14, 1915
Blackstone river.....	Sec. 18-43-16-5	June 27, 1915
Brown creek.....	Sec. 2-44-17-5	June 27, 1915
Chungo creek.....	Sec. 13-43-17-5	June 27, 1915
Cline river.....	Sec. 7-37-18-5	June 18, 1915
Martin creek.....	Sec. 27-40-15-5	June 12, 1915
Mistaya river.....	Sec. 33-34-20-5	June 27, 1915
North Saskatchewan river.....	Sec. 23-36-18-5	May 15, 1915
North Saskatchewan river.....	Sec. 14-40-13-5	August 4, 1915
Ram river.....	Sec. 13-39-11-6	June 27, 1915
Shunda creek.....	Sec. 21-40-13-5	June 1, 1915
Siffleur river.....	Sec. 31-35-17-5	May 17, 1915
Whiterabbit creek.....	Sec. 23-36-18-5	May 16, 1915

Miscellaneous measurements were made of Bighorn river (Sec. 33-39-17-5), Clearwater river (Sec. 29-35-11-5, Sec. 19-34-12-5 and Sec. 13-33-15-5), Coral creek (Sec. 12-37-19-5), Pinto creek (Sec. 33-36-21-5), Ram river (Sec. 2-38-12-5), N. Fork Ram river (Sec. 25-38-15-5), S. Fork Ram river (Sec. 9-35-15-5 and Sec. 19-36-13-5), Saunders creek (Sec. 24-40-13-5) and Whiterabbit creek (Sec. 9-35-16-5).

As the district is only very sparsely settled, gauge observers could only be obtained at the stations on Martin creek, Shunda creek and the lower station on the North Saskatchewan river. An automatic gauge was used at the upper station on the North Saskatchewan river.

Winter records were obtained on the North Saskatchewan river (both stations), Martin creek, and Shunda creek.

O. H. Hoover, B.A.Sc., was in charge of this district until May 28, 1916, when he was granted leave of absence to enlist for active service overseas. C. M. O'Neil, B.A.Sc., was in charge of the district for the balance of the year and made the final computations for the annual report.

JASPER DISTRICT

This district included the following regular gauging stations:

Stream	Location	Date Established
Athabaska river.	NW. 15-45-1-6	March 4, 1913
Athabaska river.	SE. 8-51-25-5	May 4, 1915
Lobstick river.	NE. 30-53-7-5	July 11, 1913
Maligne river.	SW. 1-46-1-6	June 17, 1914
McLeod river.	NW. 3-54-16-5	May 18, 1914
Miette river.	SW. 9-45-1-6	May 23, 1913
North Saskatchewan river.	NE. 10-49-7-5	June 20, 1915
Pembina river.	SW. 20-53-7-5	May 8, 1914
Rocky river.	NW. 13-48-28-5	July 3, 1913
Snake Indian (Stony) river.	NW. 26-48-28-5	August 8, 1916

Miscellaneous gaugings were made of Embarras river (SW. 5-52-18-5), Fiddle river (SE. 15-49-27-5), Happy creek (SE. 14-51-25-5), Hardisty creek (SE. 24-51-25-5), Maligne river (above gorge), Muskeg creek (SW. 15-54-16-5), Prairie creek (SE. 5-51-25-5), Snaring river (NW. 33-46-1-6), Sundance creek (SW. 3-53-18-5), and Wolf creek (SW. 3-54-16-5).

Winter records were obtained at all stations in this district.

It being impossible to secure an observer, an automatic gauge was installed on Maligne river on June 3, 1916. A new cable was also installed on the North Saskatchewan river at Rocky rapids.

R. J. McGuinness, Charles McGavin and W. T. Reeve were in charge of the field work for various periods and R. J. McGuinness, C. S. Dewis and W. H. Storey made the final computations for the annual report.

PEACE RIVER DISTRICT

This district included the following regular gauging stations:

Stream	Location	Date Established
Harmon river.	NW. 29-83-21-5	May 31, 1915
Lesser Slave river.	SW. 7-73-5-5	May 20, 1915
Peace river.	NE. 30-83-21-5	May 26, 1915
Peace river.	SE. 23-108-13-5	August 8, 1915
Smoky river.	SW. 10-78-24-5	June 2, 1915
Swan river.	NE. 23-72-10-5	May 19, 1915

Gauges are also maintained on Lesser Slave Lake on Sec. 19-75-14-5 and SW. 15-73-6-5.

Miscellaneous gaugings were made of Bear creek (NW. 16-81-6-6), Big Rat creek (NW. 11-80-5-6), Burnt river (SE. 7-80-1-6), Montagneuse river (NW. 31-83-6-6), Patch creek (SW. 32-83-21-5), Heart river (SW. 31-75-16-5), East Prairie river (SW. 11-74-16-5), West Prairie river (SW. 14-74-17-5), Red river (Tp. 108-5-5), Spirit river (NW. 12-78-6-6) and Wabiskaw river (Tp. 108-9-5).

In order to get good records of the winter flow of Peace river at the Vermilion chutes, it was arranged for P. H. Daniells, B.Sc., to spend the winter of 1915-16 at Fort Vermilion, the nearest settlement to the chutes. Mr. Daniells left Peace River on December 1, 1915, and arrived at Fort Vermilion on the 14th idem. During the winter he made two or three observations of the gauge per day and two or three discharge measurements per week, except for two short periods when he made reconnaissance trips to the chutes and made gaugings of Peace river there, and of the tributaries in that locality. A local resident made observations at Fort Vermilion during Mr. Daniells' absence. Mr. Daniells left Fort Vermilion again on April 8, and returned to Peace River on the 29th idem.

Winter records were also obtained at all the rest of the regular gauging stations in this district except Swan river. C. M. O'Neil was in charge of these and certain other stations in the Edmonton district from the first of January to the end of April.

SESSIONAL PAPER No. 25a

Mr. Daniells was placed in charge of the whole district in May and remained in charge until he tendered his resignation and was relieved by Charles McGavin on September 6. Mr. McGavin remained in charge for the balance of the year and when winter conditions started in November, he discontinued records of Swan river and included some of the stations formerly in the Edmonton district in his district for the winter.

The final computations for the annual report were made by A. B. Cook, Charles McGavin and C. S. Dewis.

SPECIAL INVESTIGATIONS

During 1916 an effort was made to continue the study of the absorption losses in the larger irrigation canals. No suitable section could, however, be found in the Canadian Pacific Railway Company's Bow river schemes because of repairs to structures, but careful physical examinations were made and sections selected for investigation at some later date when time and circumstances will permit of the work being done. Climatic conditions and the method of operating the farm deliveries made it impossible, without a considerable expenditure for automatic gauges, to go any further with the investigations on the Alberta Railway and Irrigation Company's canals. The work will be simpler and the results more satisfactory in years when the precipitation is below the average. Being fairly high in 1916, there was always a certain amount of drainage into the canals which offset the absorption losses. This work was done by Messrs. L. E. Kendall, B.Sc., and R. J. McGuinness.

Messrs. L. E. Kendall and R. J. McGuinness also spent about six weeks during the fall in the field investigating absorption losses in Milk river between the town of Milk River and the mouth of Deer creek. This was done in about the same manner as the investigations in canals. By the use of current-meters and automatic water stage registers, continuous records of the flow at each end of a section were obtained, and the absorption losses in cubic feet for a certain period were obtained.

BENCH-MARKS

When the stream measurement work was first started, the gauges were usually referred to bench-marks on wooden stakes or stumps of trees. These were easily shifted or destroyed and were not satisfactory. In 1911 an iron bench-mark was adopted by this branch and now almost all the gauges are either referred to bench-marks on concrete piers or other permanent structures, or to one of these iron bench-marks. Whenever an opportunity is afforded, these are tied to some railway or Dominion Government system of levels, to determine their elevation above sea level, and they are therefore also a convenient reference for local levelling operations.

Description of the iron bench-marks are given in the Report of the Progress of Stream Measurements for 1911 and 1912.

OFFICE WORK

As above intimated, the reports of the gauge height observers and the engineers are transmitted to the office by mail. These are copied to office forms and filed in a cabinet, which is carefully indexed and where they can be referred to at any time without trouble. As the engineers complete their final computations, the results are entered on convenient forms and filed in the same cabinet.

A cabinet made up of four styles of drawers is used for filing the records. The top section is used for filing the gauge height books of the observers and the current-meter notes of the engineers. The gauge height books and current-meter notes are filed alphabetically, according to the names of the streams. The next section contains the postal cards sent in by the observers and these are also filed alphabetically according to the names of the streams. The third section is made up of map drawers and contains the gauge height-area, gauge height-mean velocity and gauge height-discharge curves, and plotted cross-sections which are filed alphabetically, according to the names of the streams. The same section contains the maps showing the outlines of the drainage basins, filed numerically according to the number of the sectional sheet. The rating curves for the current-meters are also filed in this section numerically, according to the office numbers of the current-meters. The bottom section of the cabinet consists of letter size pockets, alphabetically arranged for each gauging station. The tables of gauge heights, discharge measurements, daily gauge height and discharge, monthly discharge, a description of the station and memorandum of any changes are filed in these pockets. The different rating tables for each meter are also filed numerically in this section and another drawer contains the daily and monthly reports of the meteorological service.

The copying and filing of the reports of the gauge height observers and the engineers is entrusted to an office recorder. While doing this he carefully examines all records to see that there are no errors, and where there are doubtful or impossible records it is his duty to have the data corrected or ascertain the cause of the unusual conditions. He also makes out the pay list for the observers and conducts the correspondence relating to the records.

DEPARTMENT OF THE INTERIOR

HYDROMETRIC SURVEYS-1916- PLATE NO 2.

GAUGE HEIGHT-DISCHARGE, GAUGE HEIGHT-
MEAN VELOCITY AND GAUGE HEIGHT-AREA CURVES
FOR

BOW RIVER

NEAR

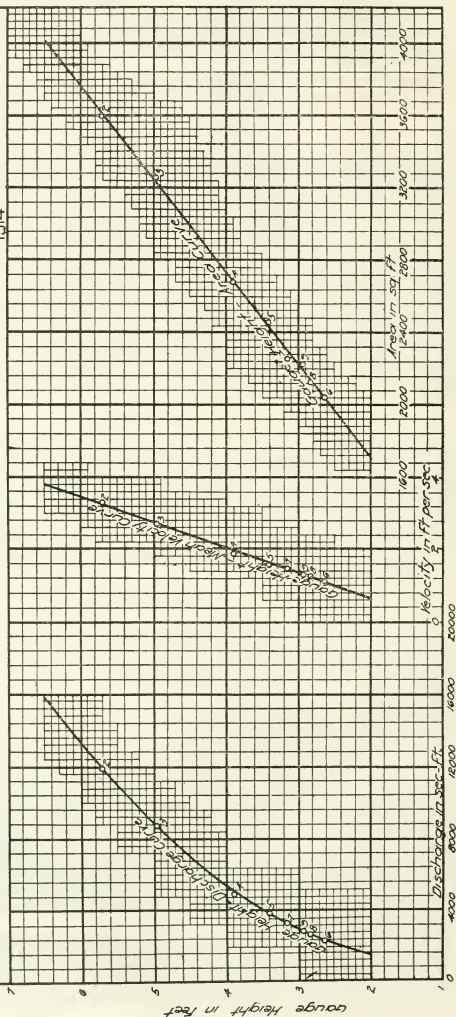
BASSAND - ALBERTA

SE. 1/4 SEC 2, T.P. 21, RGE. 19, W. OF 4TH. MER.

FOR

1914

No	Date	Area	M ²	K	G.H.	Dis
2	June 7	3537	3.25	5.71	11830	
3	" 23	3249	2.69	4.26	8750	
4	July 27	2676	1.84	3.90	4902	
5	Aug 25	2458	1.57	3.41	3851	
6	Sept 15	2035	1.10	2.64	2244	
7	Oct 10	2252	1.45	5.16	3278	
8	" 28	2115	1.23	2.84	2601	
9	Nov 27	2220	1.26	2.94	2802	



SESSIONAL PAPER No. 25B

All computations are checked before being used or published. For this reason, as far as possible, men with some technical education, or students in science, are engaged as helpers. The discharge measurements are computed by the helper and his work is checked by the engineer. In some instances where there is a great deal of driving and camping out, the engineer cannot secure a helper who can compute discharges, and in that case he computes the discharges himself and his computations are checked in the office by the office recorder.

When the territory was divided into two divisions at the beginning of 1916, J. B. Gray was appointed office recorder for the Northern Division, and W. K. Broughton for the Southern Division. When Mr. Broughton was placed in charge of the Calgary district in April, W. Meldrum was appointed office recorder for the Southern Division. Mr. Meldrum, however, enlisted with the Militia in May and W. A. Hanton was employed as office recorder for the Southern Division and retained the position for the balance of the year.

The results of the discharge measurements are plotted on cross-section paper as soon as they are received in the office. In this way a very close check is kept on the records and errors can be detected at once and in most cases can be rectified. At the same time the records are kept up to date and demands for provisional estimates can be met at an early date. Important changes in the flow are also detected at once and instructions are issued without delay to the field engineers to obtain further gaugings. This work is done by the Office Hydrometric Engineer. A. B. Cook filled this position for the Northern Division during 1916. F. K. Beach, A. M. Can. Soc. C.E., was appointed for the Southern Division but enlisted for active service overseas in May, and J. R. Estey, B.Sc., was employed as his substitute for the balance of the year.

G. H. Whyte was appointed Divisional Hydrometric Engineer in charge of the Southern Division, but enlisted for active service overseas in March, and was succeeded by V. A. Newhall, B.A.Sc. N. M. Sutherland, Grad. R.M.C., was appointed Divisional Hydrometric Engineer for the Northern Division, but enlisted with the Militia in March and was succeeded by W. H. Storey. The divisional hydrometric engineers exercise direct supervision over the field and office work by constantly checking and inspecting it. They also do considerable work in the preparation of the annual and special reports.

P. M. Sauder, D.L.S., M. Can. Soc. C.E., occupies the position of Chief Hydrometric Engineer and exercises general supervision over the survey.

Misses N. Robinson and J. Golder make up the balance of the office staff. I. R. Strome, B.A.Sc., one of the field engineers, however, worked in the office on final computations and general office work until April 30, when he was granted leave of absence to enlist for active service overseas.

FUTURE WORK

During 1917, a special effort is being made to again obtain the total spring run-off of the main streams in the Cypress hills and of Pakowki Lake drainage basin. The records obtained in former years on these streams are of special value and no doubt those of 1917 will be a valuable addition.

While the districts will be re-arranged and a few unimportant stations discontinued, most of the regular work will be continued during 1917. In view, however, of the desirability to curtail expenditures as much as possible, no new work is likely to be undertaken.

During recent years the district hydrometric engineers also acted as water-masters in the Cypress Hills districts, but the irrigation inspections have always been made by other engineers specially assigned to that work. This year, however, the Cypress Hills country is divided into smaller districts, and one engineer is to do all the work in the district. This engineer is also to advise and assist farmers in applying water to their land. He will, therefore, really fill four positions, namely, District Hydrometric Engineer, Inspecting Engineer, Water-master and Agricultural Engineer. Having a small district, he can spend most of his time in the localities where most of the water is used, get better records and be of greater service to the public. There will be less travelling and no increase in staff, so there should be a reduction in the total expenses.

The same method will be adopted in Southern Alberta, and in the Macleod district a motor car is to be used for the first time on this work.

If conditions are favourable some further investigations will be made of absorption losses in irrigation canals, but it is not likely that there will be much time or staff available for this work during 1917.

DEFINITIONS

The volume of water flowing in a stream is known as run-off or discharge. In expressing it various units are used, depending upon the kind of work for which the data are needed. Those used in this report are "second-foot," "acre-foot," "run-off per square mile" and "run-off in depth in inches," and may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second, and is the body of water flowing in a stream one foot wide and one foot deep at the rate of one foot per second.

The "acre-foot" is the unit capacity used in connection with storage for irrigation work and is equivalent to 43,560 cubic feet. It is the quantity required to cover an acre to a depth of one foot.

The expression "second-feet per square mile" means the average number of cubic feet of water flowing each second from every square mile of drainage area on the assumption that the run-off is uniformly distributed.

"Depth in inches" means the depth of water in inches that would have covered the drainage area, uniformly distributed, if all the water could have accumulated on the surface. This quantity is used for comparing run-off with rainfall, which quantity is usually given in depth in inches.

It should be noticed that "acre-feet" and "depth in inches" represent the actual quantities of water which are produced during the periods in question, while "second-feet", on the contrary, is merely a rate of flow per second.

EXPLANATION AND USE OF TABLES

The data obtained and the estimates made therefrom have been compiled in tabulated form and for each regular gauging station are given, as far as available, the following data:

1. Description of station.
2. List of discharge measurements.
3. Table of daily gauge heights and discharges.
4. Table of monthly discharges and run-off.

The description of stations gives such general information about the locality and equipment as would enable the reader to find and use the station. It also gives, as far as possible, complete history of all the changes that have occurred since the station was established and that might effect the records in any way.

The list of discharge measurements gives the results of all the discharge measurements that have been made at or in the vicinity of the gauging station or have been used in completing the records for the gauging station. It gives the date on which the measurement was made, the name of the engineer, the width and area of cross-section, the mean velocity of the current, the gauge height and the discharge in second-feet.

The table of daily gauge heights and discharges given in this report is a combination of two tables kept in the office of the survey, namely, the table of daily gauge heights and the station rating table. The table of daily gauge heights gives the daily fluctuations of the surface of the water above the zero of the gauge, as reported by the observer. During high water, two observations of the gauge were made at some stations and the gauge height given in the table is the mean of the observations for the day. Where automatic gauges are maintained the records given are the mean stage for the day. The discharge measurements and gauge heights are the base data from which the other tables are computed. The table of daily discharges is the discharge in second-feet, corresponding to the stage of the stream, as given by the station rating table.

In the table of monthly discharge the column headed "MAXIMUM" gives the mean flow for the day when the mean gauge height was highest. As the gauge height is the mean for the day, there might have been short periods when the water level and the corresponding discharge were higher than given in this column. Likewise, in the column "MINIMUM" the quantity given is the mean flow for the day when the mean gauge height was lowest. The column headed "MEAN" is the average flow for each second during the month. The computations for the quantities in the remaining columns have been based upon this mean. The drainage area for each gauging station was marked off on the sectional maps of the department and the area taken off with a planimeter. In many districts information regarding topographical features is very incomplete and the computed areas are only approximate. As the surveys of the department are extended and completed, these computations will be checked and, if necessary, corrected.

In this report a table, called the *Historic Summary*, has been added to the records for each regular gauging station that has been in operation for four years or more. It gives the discharge for each month in second-feet, the average of the discharges for the same month in each year of the whole period in second-feet and acre-feet, and the total discharge for the climatic year (October to September) in acre-feet. This table is a convenient summary of all the records secured to date at the older stations, and will no doubt be a very great convenience to busy men and those who did not receive copies of the earlier reports.

Some of the summaries in the basins of the St. Mary and Milk rivers and tributaries are arranged according to calendar years and in these cases the figures which are ignored in calculating the monthly means are printed in italics.

CONVENIENT EQUIVALENTS

The following is a list of convenient equivalents for use in hydraulic computations:

- 1 cubic foot equals 6.23 British Imperial gallons.
- 1 cubic foot equals 7.48 United States gallons.
- 1 acre equals 43,560 square feet; equals 4,840 square yards.
- 1 acre-foot equals 43,560 cubic feet.
- 1 acre-foot equals 271,472 British Imperial gallons.

SESSIONAL PAPER No. 25a

- 1 acre-foot equals 325,850 United States gallons.
 1 inch deep on 1 square mile equals 2,323,200 cubic feet.
 1 inch deep on 1 square mile equals 0.0737 second-foot per year.
 1 second-foot equals 6.23 British Imperial gallons per second; equals 373.8 gallons per minute; equals 538,272 gallons for one day.
 1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,272 gallons for one day.
 1 second-foot equals about 1 acre-inch per hour.
 1 second-foot for one day equals 1.983 acre-feet.
 1 second-foot for one 28-day month equals 55.54 acre-feet.
 1 second-foot for one 29-day month equals 57.52 acre-feet.
 1 second-foot for one 30-day month equals 59.50 acre-feet.
 1 second-foot for one 31-day month equals 61.49 acre-feet.
 1 second-foot for one 153 days equals 303.47 acre-feet.
 1 second-foot for one year equals 724 acre-feet.
 1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
 1 second-foot for one 29-day month covers 1 square mile 1.079 inches deep.
 1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
 1 second-foot for one 31-day month covers 1 square mile 1.153 inches deep.
 1 second-foot for 153 days covers 150 acres 24,278 inches or 2.023 feet deep.
 1 second-foot for one year covers 1 square mile 13,572 inches or 1.131 feet deep.
 100 British Imperial gallons per minute equals 0.268 second-foot.
 100 United States gallons per minute equals 0.223 second-foot.
 1,000,000 British Imperial gallons per day equals 1.86 second-foot.
 1,000,000 United States gallons per day equals 1.55 second-foot.
 1,000,000 British Imperial gallons equals 3.68 acre-feet.
 1,000,000 United States gallons equals 3.07 acre-feet.
 1,000,000 cubic feet equals 22.95 acre-feet.
 1 foot per second equals 0.682 miles per hour.
 1 cubic foot of water weighs 62.5 pounds.
 1 horse-power equals 550 foot-pounds per second.
 1 horse-power equals 746 watts.
 1 horse-power equals 1 second-foot falling 8.80 feet.
 1½ horse-power equals 1 kilowatt.
 1 British Columbia miner's inch equals 1.68 cubic feet per minute, or 1 second-foot approximately equals 35.7 British Columbia miner's inches.

To calculate water-power quickly: $\frac{\text{sec.-ft. } \times \text{ fall in feet}}{11} = \text{net horse-power on water wheel, realizing 80 per cent. of the theoretical power.}$

To find the number of acre-feet required for a certain acreage under the prescribed duty of water of one hundred and fifty acres for each cubic foot of water per second flowing continuously during the irrigation season (153 days), multiply the acreage by 2.02314.

METHODS OF MEASURING STREAM FLOW

There are three distinct methods of determining the surface flow of streams: (1) by measurements of slope and cross-section and the use of Chezy's and Kutter's formulae; (2) by means of weirs, which include any device or structure that by measuring the depth on a crest or sill of known length and form, the flow of water may be determined; (3) by measuring the velocity of the current and the cross-section. The third method is the one most commonly used by this survey. The second is used when the flow is too small to be accurately determined by the third, while the first is only used in making estimates of the discharge of a stream when the only data available are the cross-section and slope.

SLOPE METHOD OF DETERMINING DISCHARGE.—The slope of a stream, or rather of a section of a stream, is the difference in elevation between the upper and lower ends of the section, commonly called the fall, divided by the distance or the length of the section. Slope sections vary in length from a few hundred feet to several thousand feet, depending largely upon the nature of the stream.

It is difficult to ascertain accurately the slope of the water surface in a stream, since in nearly all streams there are pulsations in the water, causing the surface to rise and fall locally. In most streams the slope of the bottom is far from uniform, and the flow of water in any given section is more or less influenced by the flow in the adjacent section, above or below. For this reason it is a good plan to consider a number of adjacent sections, comprising a considerable length of the stream in one computation, being careful to take into account the diversity of cross-section at various places in the length, and the fact that the slope of the water surface of a stream becomes more uniform during high water and flood stages.

In determining the slope of the surface of a stream, levels are taken of the water surface at each end of the slope section, and referred to some datum or bench-mark. A good plan is to set firmly a stout wooden stake below the water surface at each end of the slope section, and then to drive a nail into the top of each stake, so that the nail-head will exactly coincide with the water surface. The difference in elevation between the two nail-heads, divided by the distance between the stakes, will give the slope.

The wetted perimeter is that portion of a stream channel that is in contact with the water. The form or outline of the wetted perimeter of a stream has an important influence upon the velocity of the current. It is usually determined graphically from the plotted cross-section or may be measured by means of a flexible tape or chain after the flood has subsided.

The hydraulic radius, which is sometimes called the mean radius of the channel below the water surface is found by dividing the area of the cross-section (in sq. ft.) by the length of the wetted perimeter (in feet).

The Chezy formula, which is the fundamental formula for stream discharge, is:

in which $Q = A V$
 Q = the discharge of the stream in sec.-ft.
 A = the area of the cross-section in sq. feet
 V = the mean velocity of flow, in ft. per sec.

In applying this formula to the determination of stream discharge, the mean velocity of a stream is considered a function of the slope and of the wetted perimeter of the stream. This may be expressed by formula as follows:

in which $V = C \sqrt{rs}$
 r = the hydraulic radius of the channel.
 s = the surface slope.
 and C is a variable coefficient, depending upon the nature of the channel.

In determining the value of C for any given case it is customary to make use of Kutter's formula, which is:

$$C = \frac{.00281 + \frac{1.811}{n}}{41.6 + \frac{s}{n}} \\ 1 + \left\{ 41.6 + \frac{.00281}{s} \right\} \sqrt{\frac{n}{r}}$$

In this formula r and s have the same significance as in the Chezy formula and the new factor n is called the coefficient of roughness. It is a variable coefficient, and its value is dependent upon the size, shape, slope and degree of roughness of the channel. Tables of values of n are given in various text books, but it is difficult to choose the correct value. It is therefore advisable, whenever possible, to compute the value of n from a measured discharge. As the slope method of determining discharge is seldom employed except to estimate flood discharge, a current-meter measurement is very often made at the slope section, during low water. Having determined the mean velocity, slope and hydraulic radius at the time of the metering, the value of C may

be found from the formula $V = C \sqrt{rs}$ or $C = \frac{V}{\sqrt{rs}}$. Trautwine's Pocket Book for Civil Engineers and other texts contain tables giving the value of n for different values of r , s and c . From these tables we can interpolate the proper value of n for a particular section of the stream, at low water stage. In most cases this value of n is applicable to high water and flood conditions of the stream also, and is used with values of r and s for the high water or flood cross-section to determine the value of C at the higher stage. Having determined the value of C the computation of the discharge is simple.

The results obtained by the slope method are in general only roughly approximate, owing to the difficulty in obtaining accurate data and the uncertainty of the value of n to be used.

WEIR METHOD OF DETERMINING DISCHARGE.—As yet few permanent weirs have been constructed by this survey, but many regular weir measurements are made on small streams by means of a temporary weir. The weir used consists of a wooden base of 2-inch plank, to which is bolted a rectangular notch of three-eighths inch steel with bevelled edges.

In making a measurement by means of a temporary weir, the following directions should be followed as far as possible. The weir should be placed perpendicular and at right angles to the bed of the stream with the crest level. The discharge should be free in so much as the nappe should have sufficient fall to allow air to have free circulation underneath it, and the head or depth on the crest should not exceed one-third of the length. The channel of approach should be several times as wide as the opening and the depth of water in the bay or pond should be at least twice the head on the weir, so as to eliminate velocity of approach and cross-currents. In choosing a site for a weir, a point should be chosen that will fulfil the above conditions and give a good-sized bay or pond.

To set up a temporary weir, a dam of sods and earth is thrown across the stream, the weir is set in place and the sods are tramped firmly around it to stop all leakage. On a stream with a sandy bed, sods or clay must be placed on the bottom for a few feet upstream to form a mattress to prevent the undermining of the dam.

SESSIONAL PAPER No. 25b

After the bay has filled up, the head of the water is observed by taking the difference in elevation of the crest of the weir and the elevation of the water surface in the bay at a distance of four to ten feet from the weir, with an engineer's level. Two common methods of getting the elevation of the water surface are: (1) hold the levelling rod on a stone or other solid body under water and subtract the depth of water on the rod from the sight on the rod; (2) drive a pin divided into tenths of feet into the bed of the stream so that an even tenth is level with the surface of the water, then hold the levelling rod on the top of the pin and add the length of pin above the water to the sight on the rod.

When the head of water has been determined, the discharge is computed by using one of the standard formulae which will suit the case. Tables giving the discharges for different heads and lengths of crests are published in many engineering texts.

The formula used by this survey for rectangular sharp-crested weirs is:

$$Q = 3.33 (L - 0.2H) H^{3/2}$$

being a modification of Francis' formula, to allow for end contractions and elimination of velocity of approach.

in which Q = discharge in sec.-ft.; L = length of crest in feet; H = head in feet.

Measurements by means of temporary weirs should be made some distance above or below the gauge. If they are made close to a gauge, the gauge must be read before the weir is placed in the stream, and the pond must be allowed to run off after the weir is removed before the gauge is re-read.

Where permanent weirs are installed, the gauge height observed is that of an auxiliary gauge above the weir, which is kept so that the head of the weir can be read direct. The weir is not usually placed so that it will interfere with the regular station, so that if at any time the weir is destroyed the regular gauge can be read during the period that the weir is out of order.

VELOCITY METHOD OF DETERMINING DISCHARGE.—There are two methods of determining the velocity of flow of a stream, namely, direct and indirect. In the direct method, by which the velocity is determined by means of floats, the liability of error is large, and the results far from satisfactory. This method is seldom used except for very rough estimates, or when a current-meter cannot be used. There are three common kinds of floats, viz.: surface, sub-surface and tube or rod floats. In each the procedure is the same. A straight piece of channel is selected for the run and two cross-sections are taken at some convenient distance apart, usually from 100 to 200 feet. They are then divided into strips by means of a tagged wire. The velocity in each strip is then measured by noting the time taken by the float in traversing the run or distance between the two cross-sections. As the time and distance are both known, the velocity can easily be computed. The velocity, whether measured by surface, sub-surface or tube floats, must be multiplied by a coefficient less than unity to reduce to the mean velocity before being used to compute the discharge.

The indirect or current-meter method is the most reliable and most widely used method of determining the velocity of the flow of a stream. The meter used by this survey is the Price patent, manufactured by W. & L. E. Gurley, Troy, N.Y. It consists of six cups attached to a vertical shaft, which revolves on a conical hardened steel point when immersed in moving water. The number of revolutions is indicated electrically. The rating or relation between the velocity of the moving water and the revolutions of the wheel is determined for each meter by drawing it through still water for a given distance at different speeds and noting the number of revolutions for each run. From this data a rating table is prepared which gives the velocity per second of moving water for any number of revolutions in a given time interval.

In making a measurement with a current-meter, a number of points, called measuring points, are measured off above and in the plane of the measuring section, at which observations of depth and velocity are taken. These points are spaced equally for those parts of the section where the flow is uniform and smooth, but should be spaced unequally for other parts according to the discretion and judgment of the engineer. In general, the points should not be spaced farther apart than five per cent of the distance between piers, nor farther apart than the approximate mean depth of the section at the time of measurement.

The measuring points divide the total cross-section into elementary strips, at each end of which observations of depth and velocity are made. The discharge of any elementary strip is the product of the average of the depths at the ends, the width of the strip, and the average of the mean velocities at two ends of the strip. The sum of the discharges of the elementary strips is the total discharge of the stream.

The accuracy of a discharge measurement taken at a velocity area station is dependent on two factors, the accuracy with which the area of the cross-section and the mean velocity of the flow normal to that section are measured. The greatest, and the most common errors in measurements of discharge are caused by erroneous soundings. Errors in soundings by weight and line are due to the weight being carried down stream, or, sometimes to the bowing of the line. Both these causes make the soundings too great. Errors in soundings with rods are due to the rod not being perpendicular, to the water rising on the rod, and to the rod sinking in the bed. In order to verify the accuracy of soundings made at medium or high stages they should be compared with those at low water. The mean velocity is also very difficult to measure accurately, because it is constantly changing. It varies not only from the surface to the bottom, but from one bank of the stream to the other, making it necessary to measure it at a number of points.

METHODS OF DETERMINING MEAN VELOCITY

There are a number of different methods of determining the mean velocity at the ends of these strips, or, as it is commonly called, the mean velocity in a vertical, namely, multiple-point, single-point, and integration. These three principal multiple-point methods in general use are the vertical velocity-curve, three-point and two-point method.

VERTICAL VELOCITY-CURVE METHOD OF DETERMINING MEAN VELOCITY.—In this method the centre of the meter is held as close to the surface of the water as possible, being careful to keep it out of reach of all surface disturbances, and then at a number of different depths throughout the vertical. The velocity at each position of the meter is recorded. These observations are then plotted with velocities in feet per second as abscissae and their corresponding depths in feet as ordinates, and a mean curve is drawn through the points. The mean velocity for the vertical is obtained by dividing the area bounded by the curve and its axis by the depth. In the absence of a planimeter for measuring the area, the depth is divided into five to ten equal parts, and the velocities of the centre ordinates of these parts are noted. The mean of these velocities will very closely approximate the mean in the vertical.

It is often more convenient, when the depth is a number of feet and a fraction, as 7.4, to divide the depth into seven parts of a foot width, and a part of 0.4 foot width. Then the velocity to enter for the narrow part is 0.4 of the velocity at the centre of it.

The vertical velocity curve is useful in studying the manner in which velocities occur in a vertical. From a study of a number of these curves the other shorter methods of determining mean velocity are deduced. On account of the length of time taken to complete a measurement, this method is not used in general routine measurements, except during the winter, for a change of stage is almost sure to occur during a measurement on a large stream which counterbalances the increased accuracy. For this reason its use is limited to the determination of the coefficient to be used in the reduction of values obtained by other methods of measuring velocity to the true value, to the measurements of velocities under new and unusual conditions of flow, and for measurements under ice.

THREE-POINT METHOD OF DETERMINING MEAN VELOCITY.—This method is one of the short methods of obtaining the mean velocity in the vertical and, under some conditions, gives the most accurate results next to the vertical velocity-curve method. It has been used almost exclusively by this survey in past years, during the open water period, but recently has been superseded by the two-point method which, under most conditions, gives more accurate results. In the three-point method, the current-meter is held at 0.2, 0.6 and 0.8 depth. The mean is then obtained by dividing by four the sum of the velocities at 0.2 and 0.8 depth plus twice the velocity at 0.6 depth.

TWO-POINT METHOD OF DETERMINING MEAN VELOCITY.—In studying the vertical curves made at a number of different points and under varied conditions, it has been found that the mean of the velocities occurring at 0.2 and 0.8 depth gives very nearly the mean velocity in the vertical. Use is made of this fact in the two-point method of determining mean velocity, the meter being held at 0.2 and 0.8 depth in the vertical. This method has been found more accurate than the single-point method and the time required for a metering is not very much greater. This method has been found to give, also, a very close approximate to the mean velocity in measurements of ice-covered streams, although these flow under very different conditions from those of open waters.

SINGLE-POINT METHOD OF DETERMINING MEAN VELOCITY.—Experiments made under most favourable conditions and extending over a long period have established the point of mean velocity in a vertical at 0.6 of the depth. Therefore the error resulting from the use of the 0.6 depth as the depth of mean velocity is very small, though in some few cases a study of the vertical velocity curve will show the need of a coefficient to reduce the observed velocities to the mean. The variation of the coefficient from unity in individual cases is, however, greater than in the two or three-point method, and the general results are not as satisfactory. For that reason this method is not employed very extensively by the survey.

In the other principal single-point method the meter is held near the surface, at from 0.5 to 1 foot below the surface, care being taken to sink the instrument below the influence of wind or waves. The resulting velocities must be multiplied by a coefficient to reduce them to mean velocities. This coefficient as found by a large number of experiments, varies from 0.78 to 0.98, depending upon the depth and speed of the stream. The deeper the stream and the greater the velocity, the larger the coefficient. In flood work coefficients varying from 0.90 to 0.95 should be used. This method is only used when the current is too strong to permit the sinking of the meter to any great depth below the surface of the water. It is often employed at time of flood, or when a stream is carrying a lot of drift-wood or ice.

INTEGRATION METHOD OF DETERMINING MEAN VELOCITY.—This method of determining the mean velocity in a vertical consists in moving the meter at a slow uniform speed from the bed of the stream to the surface and return in a vertical direction, the time and revolutions being observed. In travelling through all parts of the vertical the meter is acted upon by each and every thread of velocity from the bed to the surface of the stream, and the resulting observations determine the mean in that vertical.

This method is very useful in checking the results of other methods. It is, however, seldom, used by this survey, as the Price meter is not suited to observations by this method, since the vertical motion of the meter causes the wheel to revolve.

GAUGING STATIONS

The first step is to select a suitable locality for a gauging station. Although apparently simple, this is really a difficult task. Not only must the water be moving in nearly straight lines over a solid bed and between well defined banks, but the place must be accessible at moderate cost and there must be living near it a competent person who can be engaged to serve as observer. Permanent gauging stations should only be selected after a very thorough reconnaissance. In the irrigation districts and in more thickly populated districts there is more or less diversion of water. This is apt to complicate matters for the engineer, for a gauging station above all works may not include all the tributaries of the stream and it is often necessary to establish gauging stations at several points along the streams, and on tributaries, canals, and pipe lines in order to obtain complete information regarding the water supply in a particular stream.

There are three classes of gauging stations, namely, wading, bridge and cable stations. The wading station can of course only be used in the case of small streams having a maximum depth at its highest stage of three feet or less. The equipment for a wading station is small, consisting usually of a plain staff gauge, graduated to feet and hundredths, and fixed vertically to one of the banks of the stream. For convenience a measuring line, usually a wire with tags, may be fixed permanently at this section. When taking the reading, the engineer should stand below and to one side of the meter so as not to cause eddies in the water.

Bridge stations, because of their permanency, and the freedom of movement allowed the engineer, are much preferred. Very often, however, more particularly in swift currents, the piers materially affect the accuracy of the results. When the gauge cannot be attached to a pier it is often attached horizontally to the guard-rail or floor of the bridge, and the height of the stream is found by lowering a weight by a chain over a pulley. It is indicated by a marker on the chain. Distances of three, five or ten feet, according to the size of the stream, are marked on the lower chord of the downstream side of the bridge, to serve as a measuring line.

Frequently it is impossible to establish a permanent gauging station at a bridge. In that case the wire cable of a ferry can be utilized, or, if that is not available, a permanent wire cable is stretched across the river. For spans of average length a galvanized wire cable three-fourths of an inch in diameter is safe. It is supported at each bank by means of high struts or by passing it through the crotch of a tree. The cable is run into the ground and anchored securely to a "dead man" buried at least six feet below the surface, or, if convenient, it is anchored to a lower part of the trunk of a tree. A turnbuckle is inserted in the cable between the strut and anchorage to permit tightening the cable. A permanent measuring line, usually a wire, with tags five or ten feet apart, is stretched across the stream just above the cable. A cage large enough to carry two men and instruments is constructed and suspended from the cable by means of cast iron pulleys. The cage is moved from point to point by hand. A stay line, usually quarter-inch guy wire, is stretched across the stream about thirty to forty feet up stream from the cable, and securely fastened. By passing a sash cord through a pulley hung on this stay line the current-meter is prevented from being carried down stream. This type of station has the advantage that it can usually be located at the most desirable point on the stream and is free of piers and other obstructions.

LOW VELOCITY LIMITATIONS

Owing to the presence of a slight amount of friction in the current-meter, a certain definite velocity is required to make the wheel revolve, *i.e.*, to overcome the frictional resistance of the wheel. For this reason the meter is unsuitable for the measurement of low velocities approaching this value. This velocity, which is required to overcome friction, and which is obtained from the meter rating curve, is called the velocity of no flow for the particular meter referred to. It varies in different types of meters, and also slightly in meters of the same type, according to the time the meter is in use, but very seldom exceeds 0.2 foot per second in any meter. From a number of observations the low velocity limit, below which values of velocity are unreliable, is found to be 0.5 foot per second. In many cases at low stages the gauging station on a stream becomes unsuitable for a discharge measurement owing to the mean velocity in the section falling below the safe limit. In such instances, where it is possible to wade the stream, a suitable gauging section may be located within a reasonable distance of the regular station and the discharge measurements made at this point. When a gauging is made at a cross-section other than the regular station, sufficient soundings should be made at the latter at the time of the gauging to develop the cross-section and compute the area. The measurement is thus referred to the regular gauging station, and the mean velocity and area at the regular section are reported and used in the office computations.

OFFICE COMPUTATIONS

RATING CURVES AND TABLES.—When a series of discharge measurements has been made at a gauging station a rating curve is constructed for that station, showing graphically the discharge corresponding to any stage of the stream within the limits covered by the gaugings. This curve, as it is usually drawn, has as abscissae the discharges in second-feet, and as ordinates the corresponding gauge heights at which the discharges were made. A smooth curve is drawn through the resulting set of points, and from this curve the discharges at any stage within the limits of the curve are taken. Some measurements may be more reliable than others, owing to more or less favourable conditions at different times of gauging, or to other causes. In order to obtain the weight of the different measurements, curves with area and mean velocity, as

DEPARTMENT OF THE INTERIOR

HYDROMETRIC SURVEYS-1916- PLATE NO 3.

DIAGRAM SHOWING THE EFFECT OF AN ICE COVER ON THE
RELATION BETWEEN THE GAUGE HEIGHTS AND DISCHARGES

ST. MARY RIVER

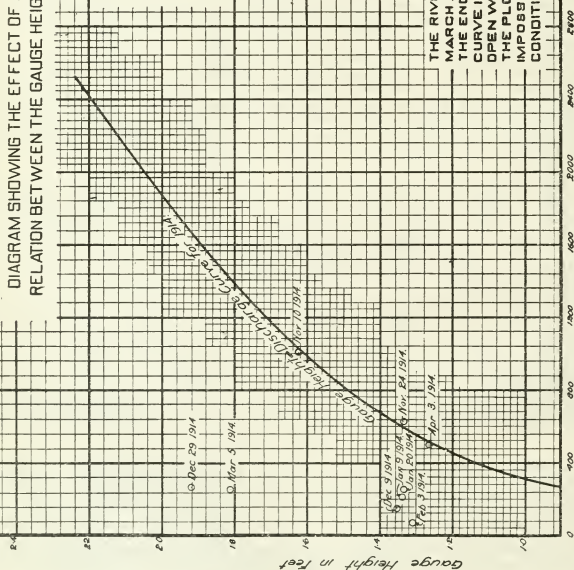
AT

WHITNEY'S RANCHE

NE 1/4 SEC 26, T 7 P, R 6 E 22 W, OF 4 THMER

FOR

1914



THE RIVER CLEARED OF ICE ABOUT THE MIDDLE OF
MARCH AND BECAME FROZEN OVER AGAIN ABOUT
THE END OF NOVEMBER. THE GAUGE HEIGHT DISCHARGE
CURVE IS BASED ON THE GAUGINGS MADE DURING THE
OPEN WATER PERIOD IN 1914 AND IS WELL DEFINED.
THE PLOTTED MEASUREMENTS ALSO SHOW HOW
IMPOSSIBLE IT IS TO DRAW A RATING CURVE WHEN ICE
CONDITIONS PREVAIL.

Discharge in Second Feet.

SESSIONAL PAPER No. 25a

abscissae, and gauge heights as ordinates, are also drawn. From a study of these curves any discrepancies in a measurement, either in its area or mean velocity, may be detected. Should it be necessary to extend the rating curve beyond the limits of actual discharge measurements, the area and mean velocity curves may be constructed to the stages for which the discharge curve is desired, and the latter found by taking the product of the two curves. The discharge curve under natural conditions of flow is always convex to the gauge height axis. The area curve is either a straight line or is convex to the gauge height axis, except in the case of overhanging banks, when it becomes concave to the axis. The mean velocity curve is always concave to the gauge height axis, except in cases where standing water occurs below the stage of no-flow. In this case the curve will assume a reverse form, starting from the gauge height of zero-flow with a curve convex to the gauge height axis and gradually reversing to a curve concave to this axis. In plotting all three curves, the horizontal and vertical scales should be chosen that the curves may be used within the limits of accuracy for the work, and in their critical position will make, as nearly as possible, angles of 45 degrees with each axis.

The rating curve being constructed, it becomes necessary to prepare a station *rating table*, giving the discharge at any stage of the stream within the limits of the daily gauge height observations on record. From this rating table the daily discharges corresponding to the daily gauge heights are read and tabulated. The rating table is constructed for tenths, half-tenths, or hundredths of feet, according to the readings of the gauge to which it is to be applied. The discharges for this table are read directly from the rating curve and are then adjusted so that the differences for successive stages shall be either constant or gradually increasing, but never decreasing, unless the station is affected by backwater.

DAILY DISCHARGE, MONTHLY MEAN, AND RUN-OFF.—The rating table being made to cover the range of daily gauge height observations, the next procedure in the computations is to make out a table of daily discharges from this rating table. The daily gauge heights are copied as they were sent in by the observer, and opposite each the corresponding discharge is filled in from the rating table. The monthly discharge is found by totalling the daily discharges for the month in question, and the monthly mean is obtained by dividing this total by the number of days in the month.

The run-off is computed with two different sets of units, depending upon the kind of work for which the data are intended, as follows:

(1) Run-off in inches is the depth to which a plane surface equal in extent to the drainage area would be covered if all the water flowing from it in a given time were conserved and uniformly distributed thereon; it is used for comparing run-off with rainfall, which is usually expressed in depth in inches. The monthly mean run-off in second-feet is divided by the area of the drainage basin in square miles to find the monthly mean run-off per square mile. This result, reduced to run-off in depth in inches for the monthly period, is in the form required.

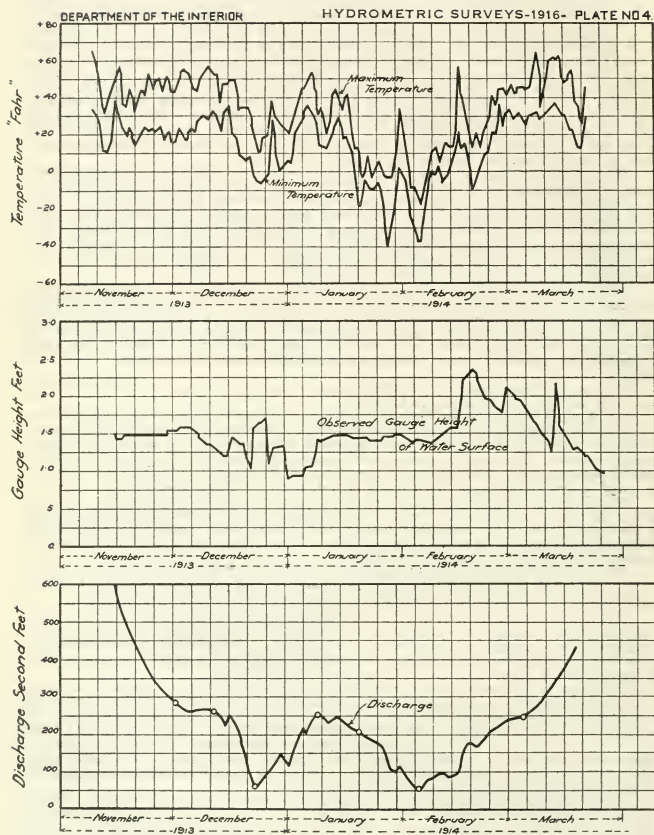
(2) The run-off in acre-feet is the form of most use in connection with storage. An acre-foot is equivalent to 43,560 cubic feet, and is the quantity of water required to cover an acre to the depth of one foot. The monthly mean run-off in second-feet is used for the computation of run-off in acre-feet. The monthly mean is reduced to cubic feet per month, and this quantity divided by 43,560 gives the run-off in acre-feet.

The run-off of the stream being computed both in depth in inches and in acre-feet for each month, the run-off for the period during which observations of run-off were made is found by the summation of the amounts of run-off for the several months making up this period.

CHANGING CONDITIONS OF CHANNEL.—On streams such as Milk river, whose bed is in a constant state of motion, measurements of discharge should be made every few days, otherwise considerable data relating to changes cannot be obtained. For discharges on days other than those on which measurements are taken, the interpolation method is used. The two methods of interpolation in general use are the Stout and Bolster methods.

The Stout method deals with the correction of the gauge heights. A curve is drawn, using the difference between the actual gauge heights at the time of measurement and the gauge height corresponding to the measured discharge as ordinates, and the corresponding days of the month as abscissae. From an irregular curve drawn through these points corrections for gauge heights can be made for days on which there was no discharge measurement. When the discharge is greater than that given by the curve the correction is positive, and vice-versa. Each daily gauge height is corrected by the amount shown on the correction curve, and the corresponding discharge taken from an approximate rating curve for the station.

The Bolster method deals more particularly with the modification of the discharge. Results of discharge measurements covering a whole year or season are plotted and, though considerably scattered, will define one or more regular curves, called standard curves, the number and position of each indicating the radical changes. Where the river bed changes from day to day, the position of the standard curve also varies and must pass through the points indicating the different days. The points indicating two successive measurements are joined by a line, which for short distances on the cross-section paper is a straight line, and otherwise a curve. This line is divided into a number of equal parts, each indicating an intervening day, the assumption being that as the change during this period is gradual the daily rating must pass through each point or day, as represented by the divisions. A simple and convenient way of making these interpolations and moving the daily rating curve is to make a tracing of the standard curve with a vertical line of reference. By keeping the lines of reference coincident, this curve can be shifted into any desired position and the discharge read for any gauge height.



OBSERVATIONS OF GAUGE HEIGHTS ON S^tMARY RIVER AT WHITNEY'S RANCH WITH CORRESPONDING MAXIMUM AND MINIMUM TEMPERATURES AND THE ESTIMATED DAILY DISCHARGES FOR THE WINTER 1913-1914.

The circles on the discharge graph indicate actual discharge measurements

SESSIONAL PAPER No. 25b

WINTER RECORDS

FORMATION OF ICE AND ICE CONDITIONS.—Perhaps the greatest difficulties in stream measurements are met with in the early part of the winter, just as the streams are commencing to freeze up. Especially is this true in the swift-running streams in or near the mountains. Needle and anchor ice often form in large quantities in rapids, and, flowing in masses with the water, make gaugings very difficult and unreliable. Even after a permanent ice cover is obtained at the gauging station this ice will, in some cases, obstruct the channel below the station and cause "backwater."

A further difficulty is that the surface ice usually forms along the edges of the stream for some time before forming in the centre of the channel. At first this may be broken away if the stream is small and open water measurement made, but later it is necessary to take some observations through holes in the ice along the edge. As the streams get farther away from the mountains their velocity decreases, and fewer rapids occur along their course. There is then less trouble with needle and anchor ice, and a permanent ice cover forms much more quickly.

In many cases the section used during the summer is very unsuitable for making measurements during the winter. It may be (a) too wide and shallow or flowing in two channels during the winter, due to low water; (b) partially open, due to swift running water or warm water running in; (c) affected by needle and anchor ice, either by flowing in the water, or causing backwater; (d) located where the snow drifts over the ice to a great depth; (e) that it is likely to have a rough ice cover or pile up with ice, due to swift water and a rough bed, (f) that there is a tendency for ice jams to occur, with consequent backwater, etc.

It is therefore often necessary to choose a new section for winter observations. This should be done before freeze-up, for then the width, depth, uniformity of flow and conditions above and below can be easily noted. The most suitable stations for winter measurements are those which have a long stretch of very smooth, sluggish water above, and a rapid fall below.

DISCHARGE MEASUREMENTS.—In winter as in summer, the daily discharges of a stream are computed from frequent discharge measurements, and daily gauge height observations. The discharge measurements are made through holes in the ice from five to ten or even twenty feet apart, depending upon the size of the stream, and large enough to allow the current-meter to pass through freely. The gaugings are made in the same manner as at open sections except that the depth of the stream is taken as the distance from the bottom of the ice to the bed of the stream. The soundings, however, are always referred to the surface of the water in the holes, the distance from the surface of the water to the bottom of the ice being measured and subtracted from the soundings to obtain the depth.

The vertical velocity curve method is usually used for the determination of the mean velocity in the vertical. A curve is plotted for each vertical, and the mean velocity is determined in the usual manner. These curves vary greatly as to form for different kinds and conditions of channel.

The typical curve, however, differs from that obtained from an open water observation in that it is drawn back more at the surface, owing no doubt to greater friction between the ice and the water as compared with the water and the atmosphere. As a result there are two points in the vertical at which the thread of mean velocity occurs under an ice cover. These points are near 0.2 and 0.8 of the total depth below the bottom of the ice, and the mean of the velocities at these two depths will give accurate results, but when close estimates of the discharges are required, and the conditions are not very favourable, the vertical velocity method should be used.

It is found that when all the holes are opened on a small swift stream, there are sometimes vertical pulsations of the water in the holes, which affect the velocity readings. This can usually be avoided by only opening one hole at a time, and filling it in again with ice and snow as soon as the observation is finished. It can also be overcome by inserting a thin sheet of galvanized tin or iron at the bottom of the hole after the meter has been lowered into the water. The meter should always be held near the upstream side of the hole.

In using the meter care must be taken to keep it under the water as much as possible to prevent ice from forming around the bearings. It is a good plan to clean and oil the meter indoors before starting out to make a gauging.

GAUGES AND GAUGE OBSERVATIONS.—The gauge is usually read once each day, the observer noting the elevation of the water as it rises in a hole cut through the ice, the height of the top of the ice, the thickness of the ice, presence of needle or slush ice, snow on top of ice, ice jams, and any sudden changes in temperature. To do this the observers are provided with an ice chisel for chopping holes, and an L-shaped ice scale to measure the thickness of the ice.

A difficulty which arises in obtaining the thickness of the ice is that in a hole kept open for some time the ice wears away around the bottom of the hole, and may make it necessary to cut a new hole near by, or to enlarge the original.

Any form of gauge may be used, but the chain gauge is the most satisfactory, as the staff gauge, being frozen to the ice, heaves with it, and also in cutting away the ice from around it the figures are effaced. The automatic gauge gives trouble with the well freezing over.

ESTIMATES OF DAILY DISCHARGE.—While the run-off, particularly during the winter months, does not vary directly in accordance with the precipitation, the rate at which it reaches the

streams is, of course, dependent almost entirely upon the climatic conditions. The climate in the mountains is subject to great extremes, but during the winter almost the entire precipitation is in the form of snow.

There is, therefore, very little surface run-off, and the flow of the streams comes almost entirely from the glaciers, ground waters and lake storage, and except for the losses due to freezing and the slight increases, due to the melting of snow and ice by chinooks (warm winds), the flow in the streams would remain constant or would change gradually.

There are, however, certain local conditions in Western Canada which make it exceptionally difficult to make estimates of the daily discharge during the winter. The gauge height in many cases fluctuates very much, and often sudden rises or drops occur. These rises are often explained by the fact that during very cold spells a great deal of slush, frazil, and anchor ice is formed and chokes up the channel, thus raising the surface of the water, when in reality the discharge is decreasing. Then, again, a chinook causes a sudden rise in temperature and the discharge is often increased, while at the same time the gauge height gradually lowers, evidently because the warmer weather and water have melted out a lot of the ice from the channel and given it a greater carrying capacity.

In order to make reliable estimates of the daily discharge, gaugings must be made at short intervals and the weather conditions and temperatures in the whole of the drainage area above the stations must be very carefully studied.

W. G. Hoyt, District Engineer, Water Resources Branch, U.S. Geological Survey, has made an exhaustive study of methods for estimating the flow when streams are frozen. The various methods described by him in an article in "Engineering News" on April 10, 1913, and Water-supply Paper 337, published by the United States Geological Survey in 1913, and modifications of them, are used. The graphic method of interpolation has been found to be generally applicable, but as the precipitation during the winter months has so little effect upon the run-off during that period, it is seldom plotted on the sheets. It is also considered that the extremes and ranges of temperatures are better guides for interpolation than the mean temperatures, and the minimum and maximum temperatures are both plotted and given due consideration rather than the mean temperatures.

The weather conditions and temperatures at the gauging station are not always typical for the whole drainage basin above, and care must therefore be taken to have the meteorological observations made at some other place, or, if necessary, at two or more places. Of course, care must be taken to study all the possible conditions which may affect the estimates.

Plate 4 shows typical conditions and illustrates the graphic method of interpolating the daily discharges.

Additional information on this subject may be found in the appendix of the 1914 report.

RATING CURRENT-METERS

Each meter is rated before being used, in order to determine the relation between the revolutions of the wheel and the velocity of the water. The meter is driven at a uniform rate of speed through still water for a given distance, and the number of revolutions of the wheel and the time are recorded. From this data the number of revolutions per second and the corresponding velocity per second are computed. Tests are made for speeds varying from the slowest which will cause the wheel to revolve to several feet per second. The results of these runs, when plotted, with revolutions per second as abscissae, and velocity in feet per second as ordinates, locate points that define the meter rating-curve, which for all meters is practically a straight line. From this curve a meter rating table is prepared. Theoretically, the rating for all meters of the same make and type should be the same, but as the result of slight variations in construction and in the bearing of the wheel on the axis at different velocities, the ratings differ.

After a meter has been in use for some time the cups may have received small injuries, or the bearing of the wheel on the axis may have changed owing to unavoidable rough usage. These changes will affect the running of the meter and change its ratings. As a consequence, each meter is re-rated at regular intervals and a new rating curve and table prepared.

Descriptions of the rating station, discussions of the methods employed, and the results of ratings, are given in the Reports of Progress of Stream Measurements for the years 1911 and 1912.

PEACE RIVER DRAINAGE BASIN

General Description

Peace river is the largest and longest tributary of the McKenzie river. It is formed by the confluence of the Finlay and Parsnip rivers, both of which rise in and drain a large district lying along the eastern slope of the Rocky mountains in northern British Columbia.

From its head the Peace flows in a general easterly direction, through a large plateau, some 300 miles, to the mouth of the Smoky river, its largest and most important tributary. Between these two points there are a few small streams entering the Peace river, the most notable being the Pine river, which rises in the hills in British Columbia near the Alberta boundary.

From the mouth of the Smoky, the river flows north for about 250 miles, nearly to Fort Vermilion, then pursues a northeasterly course for about 200 miles, where it is joined by the overflow from lake Athabaska, forming the Slave river. The territory drained by this portion of the Peace river is bounded on the north by the Laird river, and on the south and east by the Fraser and Athabaska rivers. Of several streams discharging their waters into the Peace river between the mouth of the Smoky and lake Athabaska there are only two that drain a very large area. These are the Wabiskaw and Red rivers, both of which rise on the height of land west of the Athabaska and drain a large low country lying between the Peace and Athabaska rivers, and north of the Lesser Slave lake.

Aside from these two rivers and the Smoky which receives a small portion of its supply from a thinly wooded and prairie country, the Peace has no important tributaries which cannot be considered as mountain streams. Therefore the stage of water is governed to a large extent by storage of winter precipitation in the mountains, and floods in the early spring are not usual. However, in July and August, high temperatures and warm rains in the mountains cause the snow-covered portion of the drainage basin to discharge large quantities of water, and it is at this time that the greatest floods occur.

In 1916, there were no excessive floods on the Peace river; the maximum stage was reached at the town of Peace River on July 6, and was the result of the usual high summer temperatures in the mountains and foot-hills during the latter part of the month of June.

As yet little hydrometric work has been done in the basin of the Peace river, the country being very sparsely settled, and means of transportation are few and costly, but as these improve, more information will become available.

SMOKY RIVER AT PRUDENT'S CROSSING

Location.—On the SW. $\frac{1}{4}$ Sec. 10, Tp. 78, Rge. 24, W. 5th Mer., at the ferry crossing between Prudent's crossing and F. D. McArthur's cache No. 19, until June 15, 1916, when, owing to the Provincial Government removing their ferry, a new station was established on the SW. $\frac{1}{4}$ Sec. 2, Tp. 78, Rge. 24, W. 5th Mer., two miles up stream from the ferry, and directly under the E.D. & B.C. Railway Company's bridge.

Records available.—June 2, 1915, to December 31, 1916.

Gauge.—Vertical staff on left bank of river about 200 feet up stream from Ferry tower; elevation of zero maintained at 80.50 from June 2, 1915, to June 14, 1916.

Chain gauge on downstream side of downstream guard rail 63.6 feet from west end of bridge. Elevation of zero 77.45 feet maintained from June 15, to November 15, 1916.

Bench marks.—Spike driven in poplar stump, on left bank of river near ferry and about 150 feet up stream from staff gauge. Assumed elevation 106.14 feet.

Secondary bench-mark, drift bolt northwest abutment of E.D. & B.C. Railway Company's bridge; assumed elevation 100.00 feet.

Channel.—At ferry, one channel at all stages, shifting conditions.

At bridge, one channel, shifting conditions.

Discharge measurements.—Made from ferry boat and bridge.

Winter flow.—River affected by ice from November to April.

Observers.—A. Rainville, January 1 to May 31, 1916. L. C. Vogel, from June 16 to December 31, 1916.

DISCHARGE MEASUREMENTS of Smoky river at Prudent's Crossing, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 6.....	C. M. O'Neil	850	3,316	0.34	8.21	1,111
Feb. 1.....	do	857	3,109	0.36	7.95	1,114
Feb. 27.....	do	862	3,603	0.53	8.85	1,925
Mar. 23.....	do	861	3,597	0.45	8.70	1,612
April 20.....	do	880	5,625	1.54	9.10	8,633*
May 17.....	H. S. Kerby	631	3,844	2.27	9.84	8,714
June 15.....	P. H. Daniels	864	4,605	4.42	4.95	20,366
July 1-2.....	do	877	5,616	4.51	5.50	25,342
July 19.....	do	927	7,173	3.84	5.92	27,538
Aug. 5.....	do	922	5,552	2.60	4.11	14,416
Oct. 26.....	C. McGavin	899	4,182	1.82	2.75	7,635
Nov. 11.....	do	689	3,671	1.40	1.69	5,140 _e
Dec. 8.....	do	470	2,912	0.71	3.03	2,069

* Slope measurement.

_e Estimated discharge.

DAILY GAUGE HEIGHT AND DISCHARGE of Smoky river at Prudent's Crossing, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-Ft.</i>	<i>Feet</i>	<i>Sec.-Ft.</i>	<i>Feet</i>	<i>Sec.-Ft.</i>	<i>Feet</i>	<i>Sec.-Ft.</i>	<i>Feet</i>	<i>Sec.-Ft.</i>	<i>Feet</i>	<i>Sec.-Ft.</i>
1.....	8.60 _b	1,230	7.94	1,110	8.57	1,820	8.70	2,850	12.30	20,270	11.90	17,870
2.....	8.60	1,190	7.94	1,120	8.47	1,800	8.70	3,400	12.90	24,110	12.54	21,746
3.....	8.50	1,170	7.84	1,160	8.47	1,770	8.70	3,760	12.90	24,110	12.66	22,520
4.....	8.50	1,140	7.84	1,200	8.47	1,760	8.90	3,910	12.90	24,110	12.82	23,574
5.....	8.50	1,130	7.84	1,250	8.37	1,700	9.00	4,150	13.00	24,790	13.44	27,888
6.....	8.39	1,110	7.84	1,300	8.37	1,680	9.39 _a	4,750	14.00	31,920	12.46	21,242
7.....	8.39	1,115	7.84	1,350	8.37	1,670	9.78 _a	5,850	13.75 _a	30,120	11.92	17,990
8.....	8.39	1,120	7.84	1,400	8.36	1,640	10.18 _a	6,900	13.53	28,536	11.42	15,302
9.....	8.39	1,125	7.85	1,460	8.26	1,600	10.58 _a	8,300	12.59	22,066	11.20 _a	14,200
10.....	8.29	1,130	7.75	1,510	8.16	1,560	10.98 _a	9,100	11.54	15,918	11.40 _a	15,200
11.....	8.29	1,140	7.75	1,550	8.16	1,530	11.38	10,120	10.79	12,307	11.60 _a	16,230
12.....	8.28	1,150	7.75	1,610	8.16	1,500	10.85 _a	8,800	10.33	10,434	11.80 _a	17,300
13.....	8.28	1,190	7.95	1,680	8.16	1,480	10.32 _a	8,550	10.14 _a	9,712	11.80 _a	17,300
14.....	8.28	1,230	7.95	1,740	8.16	1,450	9.79	8,400	9.95	9,030	12.00 _a	18,470
15.....	8.38	1,300	7.85	1,800	8.15	1,440	9.73 _a	8,200	9.92 _a	8,928	5.00	20,750 _x
16.....	8.38	1,380	7.85	1,870	8.05	1,450	9.67 _a	8,050	9.90 _a	8,860	6.98	35,600
17.....	8.37	1,415	7.86	1,950	8.05	1,470	9.61 _a	7,940	9.88	8,798	7.07	36,275
18.....	8.17	1,420	7.86	2,010	8.05	1,490	9.55 _{ab}	7,880	9.80	8,550	7.71	41,075
19.....	8.07	1,400	7.86	2,060	8.05	1,520	9.48	7,690	10.10	9,560	7.42	38,900
20.....	8.17	1,360	7.90	2,110	8.05	1,580	9.10	6,770	11.00	13,250	8.02	43,402
21.....	8.17	1,300	8.16	2,120	8.05	1,600	8.90	6,320	11.40	15,200	9.22	52,522
22.....	8.16	1,200	8.46	2,130	8.64	1,610	8.90	6,320	11.40	15,200	8.39	46,214
23.....	8.16	1,090	8.66	2,120	8.70	1,610	8.80	6,120	11.00	13,250	7.59	40,175
24.....	8.16	1,050	8.72	2,080	8.70	2,000	8.70	5,930	10.90	12,790	6.86	34,700
25.....	8.16	1,040	8.78	2,000	9.00	2,400	8.50	5,560	10.50	11,100	6.76	33,950
26.....	8.15	1,030	8.85	1,980	9.00	2,640	8.40	5,380	10.50	11,100	6.43	31,475
27.....	8.05	1,030	8.81	1,925	9.00	2,730	8.50	5,560	10.50	11,100	6.23	29,975
28.....	8.05	1,030	8.78	1,890	9.00	2,790	8.80	6,120	10.50	11,100	6.00	28,250
29.....	8.05	1,040	8.75	1,830	9.00	2,800	9.90	8,860	10.70	11,920	5.70	26,000
30.....	8.05	1,060	.....	.....	9.00	2,750	11.80	17,300	10.90	12,790	5.57	25,025
31.....	7.94	1,100	.....	.....	8.80	2,730	.....	.....	11.50	15,710	.....	.....

_a Gauge height interpolated._b Ice conditions, January 1 to April 18._x New gauge, June 15.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Smoky river at Prudent's Crossing, for 1916
—Concluded—

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	5.40	23,750	5.10	21,500	3.40	10,500	2.09a	5,858	2.25	6,250	3.10	2,810
2....	5.40	23,750	4.90	20,000	3.60	11,450	2.06a	5,792	2.21	6,146	3.06	2,670
3....	4.70	18,510	4.87	19,775	3.70	11,970	2.03	5,726	2.11	5,904	3.06	2,550
4....	4.80	19,250	4.80	19,250	3.90	13,100	2.01	5,682	2.15	6,000	3.06	2,460
5....	15.20	98,000	4.10	14,340	3.90	13,100	1.99	5,640	2.11	5,904	3.04	2,410
6....	11.40	69,120	3.95a	13,405	3.80	12,520	1.95	5,560	2.01	5,682	3.06	2,380
7....	9.70	56,170	3.80	12,520	3.60	11,450	2.02	5,704	2.01	5,682	3.04	2,220
8....	8.11	44,086	3.70	11,970	3.40	10,500	2.06	5,792	1.97	5,600	3.05	2,080
9....	8.40	46,290	3.70	11,970	3.30	10,050	2.08	5,832	1.86	5,388	3.05	2,050
10....	8.60	47,810	3.80	12,520	3.30	10,050	2.04	5,748	1.75	5,195	3.00	1,990
11....	8.80	49,330	3.90	13,100	3.10	9,180	2.04	5,748	1.69	5,094	2.90	1,880
12....	7.90	42,500	3.50	10,960	3.10	9,180	2.01	5,682	1.63	4,998	2.80	1,810
13....	7.20	37,250	3.60	11,450	3.00	8,760	2.01	5,682	1.58	4,920	2.70	1,750
14....	6.90	35,000	3.50	10,960	2.90	8,360	3.10	9,180	1.43	4,709	2.70	1,750
15....	6.70	33,500	3.40	10,500	2.80	7,980	4.16	14,730	3.45b	4,650	2.80	1,760
16....	5.90	27,500	3.20	9,610	2.60	7,280	4.56	17,492	3.47	4,640	2.80	1,820
17....	5.20	22,250	3.30	10,050	2.56a	7,152	4.16	14,730	3.29	4,600	2.90	1,890
18....	5.40	23,750	3.40	10,500	2.52a	7,024	3.76	12,300	3.22	4,500	3.00	1,940
19....	5.90	27,500	3.20	9,610	2.48a	6,900	3.26	9,874	3.24	4,050	3.00	1,990
20....	5.93	27,725	3.25	9,830	2.44a	6,780	2.96	8,600	3.23	3,800	2.90	1,970
21....	5.40	23,750	3.30	10,050	2.40a	6,660	2.46	6,840	3.80	3,700	2.90	1,880
22....	5.40	23,750	3.20	9,610	2.36a	6,558	2.36	6,558	3.83	3,700	2.94	1,920
23....	5.10	21,500	3.10	9,180	2.32a	6,436	2.56	7,152	3.77	3,690	2.94	1,930
24....	5.00	20,750	3.10	9,180	2.28a	6,328	2.46	6,840	3.70	3,860	2.90	1,890
25....	4.90	20,000	3.00	8,760	2.24a	6,224	2.76	7,836	3.66	3,830	2.88	1,900
26....	4.90	20,000	3.10	9,180	2.20a	6,120	2.76	7,836	3.52	3,720	2.84	1,890
27....	5.10	21,500	3.50	10,960	2.16a	6,024	2.71	7,656	3.32	3,590	2.82	1,920
28....	5.20	22,250	3.60	11,450	2.21a	6,146	2.70	7,620	3.20	3,490	2.80	1,800
29....	5.30	23,000	3.50	10,960	2.18a	6,072	2.61	7,314	3.20	3,390	2.80	1,880
30....	5.20	22,250	3.40	10,500	2.15a	6,000	2.51	6,992	3.18	3,240	2.80	1,840
31....	5.10	21,500	3.40	10,500	.....	.....	2.41	6,690	.....	.....	2.80b	1,800

a Gauge height interpolated.

b Ice conditions from November 15 to December 31.

MONTHLY DISCHARGE of Smoky river at Prudent's Crossing, for 1916

(Drainage area 18,932 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	1,420	1,030	1,175	0.062	0.07	72,239
February.....	2,130	1,110	1,701	0.090	0.10	97,842
March.....	2,800	1,440	1,857	0.098	0.11	114,183
April.....	17,300	2,850	6,961	0.368	0.41	414,208
May.....	31,920	8,550	15,698	0.829	0.96	965,232
June.....	52,522	14,200	27,704	1.463	1.63	1,648,503
July.....	98,000	18,510	32,687	1.727	1.99	2,009,858
August.....	21,500	8,760	12,070	0.637	0.73	742,160
September.....	13,100	6,000	8,528	0.450	0.50	507,416
October.....	17,492	5,560	7,764	0.410	0.47	477,393
November.....	6,250	3,240	4,664	0.246	0.27	277,508
December.....	2,810	1,750	2,027	0.107	0.12	124,637
The year.....	.....	.....	.....	.....	7.36	7,451,179

HARMON (NORTH HEART) RIVER AT PEACE RIVER

Location.—On the NW. $\frac{1}{4}$ Sec. 29, Tp. 83, Rge. 21, W. 5th Mer., about 200 feet above foot bridge located one-half mile above mouth of river and 1,500 feet above traffic bridge.

Records available.—May 31, 1915, to December 31, 1916.

Gauge.—Vertical staff; elevation of zero maintained at 88.10 feet from establishment to December 31, 1915; elevation of zero maintained at 86.71 feet during 1916.

Bench-mark.—Spike driven in fifteen-inch poplar tree eighty feet down stream from gauge; assumed elevation 100.00 feet.

Channel.—One channel at all stages, fairly permanent.

Discharge measurements.—Made from traffic bridge, during high water; by wading, during low water.

Winter flow.—River affected by ice from November to April.

Observer.—Ralph Harris.

DISCHARGE MEASUREMENTS of Harmon (North Heart) river at Peace River, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 4.....	C. M. O'Neil.....	15.0	8.26	0.80	2.17	6.6
Jan. 26.....	do.....	7.5	3.95	0.94	1.89	3.8
Feb. 23.....	do.....	28.0	26.60	0.26	2.19	7.0
Mar. 18.....	do.....	28.0	26.00	0.23	1.99	5.9
April 22.....	do.....	56.0	182.00	4.58	4.59	833.0
May 20.....	H. S. Kerby.....	58.0	138.00	3.46	2.59	477.0
June 20.....	P. H. Daniels.....	49.0	66.75	1.27	1.49	85.0
July 5.....	do.....	40.0	53.50	0.95	1.32	51.0
July 24.....	do.....	54.0	84.00	2.08	1.76	176.0
Aug. 11.....	do.....	39.0	51.40	1.23	1.30	63.0
Aug. 31.....	do.....	33.0	35.00	0.60	1.19	21.0
Oct. 12.....	C. McGavin.....	66.0	33.20	1.56	1.29	52.0
Nov. 1.....	do.....	33.0	34.65	1.09	1.39	38.0
Nov. 14.....	do.....	47.0	35.85	0.47	1.62	16.8
Dec. 15.....	do.....	54.0	12.14	0.17	2.26	2.0

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Harmon (North Heart) river at Peace River, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	2.32 ^b	7.0	1.89	4.0	2.19	6.8	2.09	6.4	3.79	680	2.06	286
2....	2.32	6.7	1.89	4.0	2.19	6.7	4.19	50.0	3.69	660	2.06	286
3....	2.32	6.5	1.89	3.9	2.19	6.6	4.19	120.0	3.69	665	2.06	286
4....	2.22	6.5	1.89	3.8	2.19	6.5	4.29	180.0	3.69	670	2.06	286
5....	2.22	6.7	1.89	3.8	2.19	6.5	4.29	210.0	3.69	675	2.06	286
6....	2.22	6.4	1.89	3.8	2.19	6.6	4.29	265.0	3.59	656	2.06	286
7....	2.13	6.0	1.89	3.8	2.09	6.8	4.39	400.0	3.59	660	1.96	250
8....	2.13	6.0	1.89	3.7	2.09	6.8	4.39 ^b	480.0	3.39	615	1.96	250
9....	2.14	6.0	1.90	3.4	2.09	6.7	3.39	518.0	3.39	619	1.96	250
10....	2.04	5.9	1.80	3.3	2.09	6.6	3.39	518.0	3.38	623	1.96	250
11....	2.04	5.8	1.80	4.0	2.09	6.3	4.19	715.0	3.28	602	1.95	246
12....	2.05	5.7	1.80	5.4	2.09	6.1	4.29	739.0	3.18	582	1.95	246
13....	2.05	5.7	3.20	7.4	1.99	5.8	4.29	739.0	3.18	587	1.95	246
14....	2.06	5.7	3.20	9.5	1.99	5.7	4.49	788.0	3.08	567	1.85	210
15....	2.06	6.0	3.20 ^a	11.4	1.99	5.8	4.49	788.0	2.98	547	1.85	210
16....	2.76	8.3	3.20 ^a	13.0	1.99	5.8	4.49	788.0	2.88	530	1.75	174
17....	2.57 ^a	9.9	3.20 ^a	13.8	1.99	5.9	4.29	739.0	2.88	534	1.65	138
18....	2.37 ^a	9.8	3.20 ^a	13.8	1.99	5.9	4.29	739.0	2.68	489	1.65	138
19....	2.18 ^a	8.6	3.20 ^a	13.3	1.99	6.0	4.39	764.0	2.68	494	1.65	138
20....	2.08	7.2	3.30 ^a	11.9	1.99	6.0	4.49	788.0	2.57	469 ^s	1.64	134
21....	2.08	6.0	3.20 ^a	9.8	1.99	6.0	4.59	812.0	2.57	469	1.64	134
22....	2.09	5.1	3.21	7.6	1.99	6.0	4.39	764.0	2.47	433	1.64	134
23....	1.99	4.7	2.19	7.1	1.99	6.0	4.49	838.0 ^s	2.37	397	1.64	134
24....	1.99	4.6	2.19	7.1	1.99	6.0	4.49	842.0	2.37	397	1.54	104
25....	2.00	4.0	2.19	7.2	1.99	6.0	4.29	774.0	2.27	361	1.54	104
26....	1.89	3.8	2.19	7.2	1.99	6.0	4.19	754.0	2.27	361	1.54	104
27....	1.89	3.8	2.19	7.2	1.99	6.0	3.99	710.0	2.27	361	1.54	104
28....	1.89	3.9	2.19	7.2	1.99	6.0	3.99	715.0	2.17	325	1.54	104
29....	1.89	3.9	2.19	7.0	1.99	6.0	3.79	670.0	2.17	325	1.54	104
30....	1.89	4.0	.....	.....	1.99	6.0	3.79	675.0	2.17	325	1.54	104
31....	1.89	4.0	.....	.....	1.99	6.0	.....	.....	2.12 ^a	307	.....	.....

^a Gauge height interpolated.^b Ice conditions January 1 to April 8.^s Shifting conditions April 23 to May 20.

DAILY GAUGE HEIGHT AND DISCHARGE of Harmon (North Heart) river at Peace River for 1916.
—Concluded.

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	1.54	104	1.60	140	1.20	22	1.27	41	1.39	35.0	1.88	12.80
2....	1.64	134	1.60	142	1.20	22	1.27	42	1.39	35.0	1.88	13.00
3....	1.80	192	1.60	144	1.20	23	1.26	41	1.51 ^b	37.0	1.88	12.70
4....	1.90	228	1.50	112	1.20	23	1.26	41	1.53	35.0	1.89	12.30
5....	2.00	264	1.50	115	1.20	24	1.26	42	1.65	33.0	1.49	8.20
6....	2.80	552	1.40	88	1.20	24	1.26	43	1.67	31.0	1.49	8.10
7....	2.90	588	1.40	85	1.20	25	1.26	44	1.68	29.0	1.99	8.20
8....	2.90	588	1.40	82	1.20	25	1.26	44	1.69	27.0	2.00	7.50
9....	2.90	588	1.40	78	1.19	25	1.26	45	1.70	25.0	2.00	6.09
10....	2.80	552	1.40	74	1.19	26	1.26	46	1.62	23.0	2.00	4.90
11....	2.40	408	1.40	70	1.19	27	1.26	47 ^a	1.54	21.0	2.00	3.50
12....	2.20	336	1.40	66	1.19	27	1.25	46	1.56	19.3	2.00	2.80
13....	2.20	336	1.30	59	1.19	28	1.25	46	1.58	18.0	1.90 ^a	2.50
14....	2.20	336	1.30	57	1.19	28	1.25	46	1.60	16.8	1.70 ^a	2.20
15....	2.20	336	1.30	55	1.19	29	1.24	44	1.70	16.7	1.51 ^a	2.00
16....	2.20	336	1.30	53	1.19	29	1.34	57	1.71	17.0	1.31	2.00
17....	2.20	336	1.20	42	1.18	29	1.34	57	1.71	17.3	1.21	1.90
18....	2.20	336	1.20	41	1.18	30	1.34	57	1.72	17.1	1.10	1.80
19....	2.10	310	1.10	31	1.19 ^a	32	1.33	55	1.72	16.6	1.10	1.70
20....	2.10	310	1.10	30	1.20 ^a	34	1.43	73	1.73	16.3	1.10	1.60
21....	2.00	264	1.10	28	1.21 ^a	34	1.43	73	1.73	16.2	1.10	1.52
22....	1.90	228	1.00	20	1.22 ^a	35	1.42	71	1.74	15.7	1.20	1.41
23....	1.80	192	1.00	19	1.23 ^a	36	1.42	71	1.84	15.0	1.20	1.30
24....	1.80	192	0.90	13	1.24 ^a	37	1.42	71	1.85	14.1	1.20	1.30
25....	1.80	194 ^s	0.90	12	1.25 ^a	38	1.42	71	1.85	13.7	1.20	1.22
26....	1.80	197	0.70	9	1.27	39	1.31	53	1.86	13.7	1.20	1.02
27....	1.70	165	0.60	7	1.27	39	1.21	41	1.86	13.0	1.20	1.01
28....	1.70	168	0.60	7	1.27	40	1.20 ^a	40	1.87	12.5	1.20	0.82
29....	1.70	170	0.50	6	1.27	40	1.17 ^a	37	1.87	12.7	1.20	0.70
30....	1.70	172	0.50	6	1.27	41	1.13 ^a	34	1.87	13.2	1.20	0.70
31....	1.60	138	1.20	21	.....	.....	1.10 ^a	31	.....	.....	1.20 ^b	1.00

^a Gauge height interpolated.

^b Ice conditions November 3 to December 31.

^s Shifting conditions July 25 to October 11.

MONTHLY DISCHARGE of Harmon (North Heart) river at Peace River, for 1916

(Drainage area 510 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	9.9	3.80	5.9	0.012	0.01	363
February.....	13.8	3.30	7.2	0.014	0.02	414
March.....	6.8	5.70	6.2	0.012	0.01	381
April.....	842.0	6.40	596.0	1.169	1.30	35,464
May.....	680.0	307.00	516.0	1.012	1.17	31,728
June.....	286.0	104.00	191.0	0.375	0.42	11,365
July.....	588.0	104.00	298.0	0.584	0.67	18,323
August.....	144.0	6.00	55.0	0.108	0.12	3,382
September.....	41.0	22.00	30.0	0.059	0.07	1,785
October.....	73.0	31.00	53.0	0.104	0.12	3,259
November.....	37.0	12.50	21.0	0.041	0.05	1,250
December.....	13.0	0.70	4.1	0.008	0.01	252
The year.....					3.97	107,966

SESSIONAL PAPER No. 25B

PEACE RIVER AT PEACE RIVER

Location.—On the NE. $\frac{1}{4}$ Sec. 30, Tp. 83, Rge. 21, W. 5th Mer., about 1,200 feet below the mouth of the Harmon (North Heart) river, 300 feet north of Mr. H. White's house.

Records available.—May 28, 1915, to December 31, 1916.

Gauge.—Vertical staff, on left bank of river; elevation of zero maintained at 70.70 feet from May 28 to November 13, 1915; elevation of zero maintained at 68.82 feet from November 13, 1915, to December 31, 1916.

Bench-mark.—Spike driven in stump of poplar tree, on left bank of river about 200 feet upstream from gauge; assumed elevation 93.61 feet.

Channel.—One channel at all stages, fairly permanent.

Discharge measurements.—Made from ferry boat at ferry crossing, about 150 feet above mouth of Harmon (North Heart) river, or from small motor boat when ferry is not available.

Winter flow.—River affected by ice from November to May.

Observer.—Harry White.

Remarks.—It has not been possible to record the drainage area from maps available.

DISCHARGE MEASUREMENTS of Peace river at Peace River, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 2.....	C. M. O'Neil.....	1,122	12,517	0.84	4.12	10,483
Jan. 27.....	do.....	1,060	10,634	0.74	2.60	7,887
Feb. 24.....	do.....	1,122	11,067	1.01	4.12	11,214
Mar. 19-20.....	do.....	1,120	11,173	0.93	4.05	10,358
April 24.....	do.....	1,140	15,228	1.92	5.27	29,042 _x
May 21.....	H. S. Kerby.....	1,325	21,830	6.02	9.58	131,011
May 22.....	do.....	.....	23,930	6.42	10.70	153,630 _x
June 19.....	P. H. Daniells.....	1,592	33,600	6.34	14.44	213,024 _x
July 7.....	do.....	1,610	34,946	6.62	15.29	231,342 _x
July 10.....	do.....	1,590	32,805	6.13	14.39	200,095 _x
July 23.....	do.....	1,426	25,692	5.79	9.64	148,802
Aug. 12.....	do.....	1,316	19,796	4.05	6.44	80,222
Oct. 9.....	C. McGavin.....	.....	13,900	1.74	3.10	24,150 _e
Oct. 31.....	do.....	1,171	14,643	1.99	3.53	29,199
Nov. 16.....	do.....	.....	10,233	1.20	1.34	12,280 _e
Dec. 13-14.....	do.....	1,120	9,342	0.72	2.40	6,686

_x Slope measurement.

_e Estimated discharge, based on area and velocity.

NOTE.—Discharge measurements made above Harmon (North Heart) river, but records of daily and monthly discharge include flow of Harmon (North Heart) river.

DAILY GAUGE HEIGHT AND DISCHARGE of Peace river at Peace River, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	4.10 ^b	10,397	3.83	7,954	4.40	11,897	4.00	10,446	7.34	90,844	10.57	150,045
2....	4.12	10,490	3.85	8,004	4.36	11,297	4.00	10,650	7.74	97,922	10.72	152,820
3....	4.09	10,547	3.87	8,034	4.37	10,867	4.20	10,910	8.30	108,080	10.36	146,160
4....	4.06	10,517	3.89	8,074	4.23	10,456	4.30	11,290	8.90	119,150	10.41	147,085
5....	4.03	10,367	3.90	8,084	4.19	10,206	4.60	11,850	11.66	170,210	12.16	179,460
6....	4.01	10,296	3.91	8,114	4.15	9,907	4.70	12,545	12.26	181,310	13.00	195,000
7....	3.94	10,006	3.92	8,114	4.11	9,697	4.80	13,230	12.07	177,795	12.40	183,900
8....	3.96	9,746	3.94	8,094	4.01	9,507	5.20	13,900	11.67	170,365	11.45	166,325
9....	3.94	9,456	3.96	8,093	3.97	9,387	5.15 ^a	14,328	11.48	166,880	10.79	154,115
10....	3.91	9,286	3.82	8,113	3.94	9,287	5.05	14,698	8.93	119,705	10.19	143,015
11....	3.89	9,136	3.78	8,124	3.93	9,226	5.08	15,125	8.64	114,340	9.74	134,690
12....	3.86	9,016	3.80	8,135	3.89	9,216	5.08	15,519	7.94	101,500	9.18	124,330
13....	3.84	8,966	3.81	8,177	3.89	9,266	5.48	15,839	7.60	95,430	9.03	121,555
14....	3.82	8,936	3.78	8,220	3.90	9,356	5.88	16,198	7.21	88,565	9.03	121,555
15....	3.79	8,956	3.74	8,301	3.96	9,506	6.18	16,698	6.91	83,343	9.37	127,845
16....	3.77	9,048	3.76	8,423	3.96	9,726	6.48	17,178	6.72	80,064	10.62	150,970
17....	3.74	9,110	3.78	8,634	3.97	10,016	8.88	17,919	6.72	80,064	12.62	188,710 ^a
18....	3.72	9,130	3.85	8,914	4.03	10,216	4.18	18,609	6.93	83,689	14.21	218,865
19....	3.70	9,134	3.92	9,293	4.00	10,326	4.58	19,364	7.63	95,964	14.44	223,675
20....	3.67	9,027	3.93	9,712	4.00	10,396	4.58	20,268	8.99	120,815	14.43	224,230
21....	3.70	8,896	3.94	10,010	4.10	10,406	5.08	21,012	9.85	136,725	15.34	241,805
22....	3.72	8,765	3.95	10,368	4.10	10,346	5.28	27,764	10.60	150,600	15.29	241,620
23....	3.85	8,615	3.96	10,767	4.10	10,226	5.38	28,838	10.80	154,300	15.24	241,250
24....	3.80	8,455	3.97	11,247	4.10	10,126	5.27	29,042	10.50	148,750	14.89	235,515
25....	3.78	8,224	4.15	11,837	4.05	10,106	5.01	40,774	10.09	141,165	14.54	229,780
26....	3.77	8,054	4.31	12,397	4.00	10,096	4.91 ^b	49,801	9.44	129,140	14.19	224,045
27....	3.77	7,904	4.42	12,637	4.00	10,116	4.92	49,962	9.44	129,140	13.69	215,350
28....	3.79	7,844	4.48	12,717	4.00	10,136	4.82	48,360	10.08	140,980	13.39	210,540
29....	3.81	7,844	4.49	12,537	4.00	10,186	5.83	64,917	12.93	193,705	13.03	204,620
30....	3.83	7,884	.....	.....	4.00	10,256	6.53	76,810	11.08	159,480	12.63	197,960
31....	3.84	7,914	.....	.....	4.00	10,336	.....	.....	10.77	153,745	.....	.....

^a Gauge height interpolated.^b Ice conditions, January 1 to April 26.^c Shifting conditions, June 17 to July 15.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Peace river at Peace River, for 1916—*Concluded*

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	12.19	190,375	7.39	99,902	4.31	40,765	3.26	26,060	3.44	28,080	3.48	10,813
2....	12.84	203,140	7.29	97,823	4.36	41,590	3.31	26,610	3.36	27,160	3.42	11,933
3....	11.44	177,980	7.14	94,724	4.22	39,280	3.46	28,320	3.30	26,500	3.49	10,813
4....	11.09	172,060	6.99	91,635	4.17	38,470	3.51	28,930	3.17	25,070	3.55	10,412
5....	11.59	182,050	7.09	93,694	4.17	38,470	3.71	31,535	2.98b	23,833	3.71	10,008
6....	15.86	261,785	7.09	93,694	4.22	39,280	3.51	28,930	2.82	22,811	3.73	9,638
7....	15.29	251,980	6.89	89,585	4.27	40,105	3.32	26,720	2.66	21,829	3.55	9,238
8....	15.09	248,835	6.79	87,535	4.22	39,280	3.15	24,850	2.60	21,307	3.46	8,858
9....	14.79	244,025	6.59	83,436	4.17	38,470	3.10	24,300	2.55	20,875	3.32	8,326
10....	14.39	237,365	6.54	82,416	3.98	35,440	3.05	23,800	2.54	19,023	3.19	7,805
11....	13.89	228,855	6.54	82,416	3.88	33,910	3.05	23,800	2.45	17,371	2.68	7,244
12....	13.19	216,460	6.44	80,376	3.78	32,480	3.01	23,400	2.35	14,919	2.47	6,953
13....	12.39	202,400	6.29	77,327	3.68	31,440	3.01	23,400	2.21	13,868	2.41	6,752
14....	11.79	192,040	5.96	70,770	3.68	31,140	2.96	22,936	1.80	13,067	2.40	6,702
15....	11.39	185,195a	5.69	65,505	3.68	31,140	2.97	23,027	1.35	12,397	2.40	6,802
16....	10.94	177,574	5.49	61,610	3.68	31,140	2.97	23,027	1.34	12,317	2.42	7,082
17....	11.44	188,624	5.44	60,660	3.54	29,320	3.32	26,720	1.08	12,467	2.44	7,050
18....	11.49	189,729	5.39	59,710	3.49	28,680	4.13	37,830	1.34	12,637	2.46	6,942
19....	11.19	183,099	5.09	54,120	3.39	27,490	4.68	46,910	1.91	12,537	2.47	6,962
20....	10.89	176,469	4.70	47,250	3.29	26,390	4.98	52,150	2.99	11,656	2.49	7,082
21....	10.44	166,524	4.45	43,075	3.24	25,840	4.79	48,825	3.85	11,636	2.51	7,052
22....	10.09	158,789	4.20	38,950	3.19	25,290	4.44	42,910	4.19	11,696	2.53	7,241
23....	9.59	147,739	4.00	35,750	3.19	25,290	4.19	38,790	4.13	11,665	2.54	7,301
24....	9.29	141,109	3.90	34,200	3.15	24,850	4.05	36,550	4.12	11,614	2.56	7,241
25....	9.04	135,584	3.90	34,200	3.10	24,300	3.90	34,200	4.07	11,494	2.58	7,401
26....	8.84	131,164	4.00	35,750	3.00	23,300	3.95	34,975	3.86	11,364	2.60	7,531
27....	8.54	124,566	4.11	37,510	2.90	22,390	3.70	31,400	3.57	11,273	2.61	7,481
28....	8.14	115,822	4.21	39,115	2.85	21,945	3.61	30,230	3.66	11,192	2.63	7,401
29....	7.89	110,418	4.26	39,940	2.95	22,845	3.56	29,580	3.54	11,013	2.65	7,391
30....	7.59	104,090	4.21	39,115	3.15	24,850	3.54	29,320	2.98	10,913	2.67	7,581
31....	7.44	100,946	4.41	42,415	.....	.....	3.52	29,060	.....	.....	2.69b	7,751

b Ice conditions, November 5 to December 31.

a Shifting conditions, June 17 to July 15.

MONTHLY DISCHARGE of Peace river at Peace River, for 1916

(Drainage area \pm square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square mile	Depth in inches on Drainage Acre	Total in Acre-feet
January.....	10,547	7,844	9,096	.....	.....	559,291
February.....	12,717	7,954	9,349	.....	.....	537,761
March.....	11,897	9,216	10,068	.....	.....	619,057
April.....	76,810	10,446	24,461	.....	.....	1,455,530
May.....	193,705	80,064	128,503	.....	.....	7,901,341
June.....	241,805	121,555	183,228	.....	.....	10,902,822
July.....	261,785	100,946	178,929	.....	.....	11,001,915
August.....	99,902	34,200	64,329	.....	.....	3,955,436
September.....	41,590	21,945	31,173	.....	.....	1,854,922
October.....	52,150	22,936	30,939	.....	.....	1,902,365
November.....	28,080	10,913	16,119	.....	.....	859,147
December.....	11,033	6,702	7,996	.....	.....	491,555
The year.....	.....	.....	.....	.....	.....	42,141,242

 \pm As a large portion of the drainage area is unsurveyed, it is impossible to compute the area drained.

PEACE RIVER AT FORT VERMILION

Location.—On the SE. $\frac{1}{4}$ Sec. 23, Tp. 108, Rge. 13, W. 5th Mer., at the mounted police barracks, about one mile west of the Hudson's Bay Company's store. Winter section NE. $\frac{1}{4}$ Sec. 24, Tp., 108, Rge., 13, W. 5th. Mer.

Records available.—August 8, 1915, to November 5, 1915; December 16, 1915, to April 29, 1916, and August 17, 1916, to December 31, 1916.

Gauge.—Vertical staff; elevation of zero maintained at 66.50 feet. Winter gauge elevation of zero 68.81 feet.

Bench-mark.—Spike driven in four-inch poplar stump; 300 feet up stream from gauge, 150 feet from edge of river; assumed elevation 100.00 feet.

Channel.—One channel at all stages, shifting.

Discharge measurements.—Made from boat, about one and one-half miles below gauge at Hudson's Bay Company's east property line.

Winter flow.—River affected by ice from November to May.

Observer.—R. W. McLeod.

Remarks.—Gauge heights only are recorded from August 17, to December 31, 1916.

DISCHARGE MEASUREMENTS of Peace river at Fort Vermilion, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 3, 4.....	P. H. Daniells.....	1,100	19,196	0.63	3.12	12,109
Jan. 5, 6.....	do.....	1,100	19,079	0.60	3.09	11,429
Jan. 7, 8.....	do.....	1,095	18,980	0.62	3.14	11,744
Jan. 11, 12, 13.....	do.....	1,090	18,742	0.53	2.70	9,922
Jan. 14, 15.....	do.....	1,085	18,542	0.53	2.63	9,795
Jan. 17, 18.....	do.....	1,085	18,396	0.55	2.62	10,084
Jan. 31, Feb. 1, 2.....	do.....	1,085	18,430	0.49	2.40	9,048
Feb. 4, 5.....	do.....	1,085	18,364	0.46	2.40	8,519
Feb. 7, 8.....	do.....	1,085	18,136	0.45	2.31	8,148
Feb. 11, 12.....	do.....	1,085	17,671	0.45	2.22	7,942
Feb. 14, 15.....	do.....	1,080	17,556	0.43	2.12	7,542
Feb. 16, 17.....	do.....	1,080	17,264	0.43	2.08	7,479
Feb. 18, 19.....	do.....	1,080	17,218	0.44	2.03	7,569
Feb. 22, 23.....	do.....	1,080	17,109	0.43	1.95	7,308
Feb. 25, 26.....	do.....	1,080	17,020	0.45	1.97	7,678
Mar. 3, 4, 5.....	do.....	3,400	26,741	0.46	.....	12,282 _x
Mar. 8, 9.....	do.....	1,075	17,844	0.63	2.92	11,165
Mar. 10, 11.....	do.....	1,075	17,796	0.59	2.80	10,549
Mar. 14, 15.....	do.....	1,075	17,562	0.48	2.42	8,407
Mar. 17, 18.....	do.....	1,075	17,213	0.49	2.40	8,432
Mar. 20, 21.....	do.....	1,075	17,240	0.51	2.47	8,524
Mar. 23, 24.....	do.....	1,075	17,371	0.54	2.65	9,354
Mar. 27, 28.....	do.....	1,065	17,386	0.55	2.83	9,640
Mar. 31, April 1.....	do.....	1,060	17,426	0.53	2.77	9,313
April 4, 5.....	do.....	1,065	16,983	0.55	2.74	9,339
Aug. 17.....	do.....	1,694	34,319	1.89	11.25	65,236

_x Measurement taken at Chutes; no gauge.

SESSIONAL PAPER No. 25^a

DAILY GAUGE HEIGHT AND DISCHARGE of Peace river at Fort Vermilion, for 1916

Day	January		February		March		April	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	3.10 ^b	12,000	2.42	9,050	2.75	10,550	2.76	9,300
2.....	3.10	12,050	2.40	8,870	2.82	11,120	2.77	9,310
3.....	3.11	12,050	2.38	8,700	2.95	11,550	2.74	9,300
4.....	3.12	12,000	2.41	8,560	2.94	11,520	2.73	9,300
5.....	3.09	11,500	2.39	8,450	2.94	11,450	2.75	9,340
6.....	3.08	11,500	2.37	8,290	2.93	11,360	2.74	9,360
7.....	3.14	11,725	2.35	8,200	2.92	11,250	2.74	9,470
8.....	3.15	11,700	2.31	8,080	2.92	11,200	2.81	9,620
9.....	3.05	11,250	2.31	8,040	2.90	11,100	2.95	11,000 ^c
10.....	2.95	10,700	2.30	8,000	2.84	10,750	3.19	12,000
11.....	2.90	10,110	2.28	7,970	2.77	10,320	4.24	15,000
12.....	2.76	9,900	2.17	7,910	2.66	9,630	5.09	17,000
13.....	2.67	9,800	2.16	7,750	2.59	9,000	6.69	23,000
14.....	2.63	9,750	2.17	7,620	2.45	8,500	7.99	28,000
15.....	2.62	9,780	2.12	7,530	2.39	8,330	9.09	34,000
16.....	2.61	9,950	2.08	7,480	2.39	8,310	10.04	41,000
17.....	2.61	10,100	2.08	7,480	2.39	8,340	11.19	57,000
18.....	2.62	10,200	2.04	7,500	2.39	8,500	11.74	66,000
19.....	2.63	10,225	2.01	7,570	2.41	8,610	12.54	71,000
20.....	2.64	10,230	2.00	7,500	2.44	8,750	14.74	101,000
21.....	2.60	10,150	1.97	7,380	2.49	8,950	13.49	81,000
22.....	2.59	10,040	1.95	7,300	2.54	9,120	12.29	70,000
23.....	2.55	9,920	1.95	7,330	2.61	9,280	11.59	62,000
24.....	2.50	9,700	1.95	7,380	2.69	9,440	15.49	105,000
25.....	2.46	9,500	1.97	7,540	2.72	9,530	14.09	90,000
26.....	2.43	9,270	1.98	7,850	2.80	9,620	12.94	79,000
27.....	2.43	9,170	2.16	8,370	2.82	9,640	11.44	64,500
28.....	2.42	9,110	2.37	9,000	2.83	9,650	10.99 ^b	61,500
29.....	2.42	9,080	2.62	9,850	2.84	9,600	10.79	60,500 ^c
30.....	2.42	9,060	.....	.....	2.82	9,480	.....	.....^x
31.....	2.41	9,050	.....	.....	2.79	9,350	.....	.....

^b Ice conditions January 1 to April 23.^c Discharge estimated April 9-29.^x No gauge height observations from April 30 to August 16.

DAILY GAUGE HEIGHT AND DISCHARGE of Peace river at Fort Vermilion, for 1916—*Concluded*

Day	August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			8.84		7.49		7.39		5.74	
2.....			8.94		7.29		7.19		5.64	
3.....			8.94		7.14		6.99		5.64	
4.....			8.94		6.99		6.94		5.64	
5.....			8.94		6.59		6.84		5.64	
6.....			8.84		6.49		6.84		5.64	
7.....			8.74		6.29		6.84		5.64	
8.....			8.69		6.24		6.84		5.64	
9.....			8.64		6.69		6.69		5.64	
10.....			8.59		7.24		6.64b		5.64	
11.....			8.44		7.29		6.64		5.64	
12.....			8.34		7.24		6.64		5.64	
13.....			8.29		7.59		6.54		5.64	
14.....			8.24		7.34		6.44		5.64	
15.....			8.24		7.09		6.34		5.64	
16.....			8.09		6.89		6.14		5.64	
17.....	10.94		7.94		6.69		5.84		5.64	
18.....	10.79		7.84		6.59		5.84		5.54	
19.....	10.59		7.79		7.14		5.84		5.54	
20.....	10.39		7.64		7.79		5.94		5.44	
21.....	10.19		7.59		8.39		5.94		5.44	
22.....	9.99		7.49		8.99		5.84		5.34	
23.....	9.79		7.29		9.29		5.84		5.34	
24.....	9.59		7.09		8.99		5.74		5.34	
25.....	9.39		6.89		8.79		5.74		5.24	
26.....	9.19		7.14		8.39		5.74		5.24	
27.....	9.04		7.19		8.14		5.74		5.24	
28.....	9.04		7.04		8.04		5.74		5.14	
29.....	8.94		7.09		7.94		5.74		5.14	
30.....	8.79		7.34		7.89		5.74		5.14	
31.....	8.84				7.69				5.04b	

b Ice conditions November 10 to December 31.

MONTHLY DISCHARGE of Peace river at Fort Vermilion, for 1916

(Drainage area *x* square miles)

MONTH	DISCHARGE IN SECOND-FEET			RUN-OFF Total in Acre-feet
	Maximum	Minimum	Mean	
January.....	12,050	9,050	10,341	635,843
February.....	9,850	7,300	8,019	461,258
March.....	11,550	8,310	9,800	602,578
April (1-29).....	105,000	9,300	42,224	2,428,753
The period.....				4,128,432

x As a large portion of the drainage area is unsurveyed, it is impossible to compute the area drained.

SESSIONAL PAPER No. 258

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Peace river drainage basin, in 1916

Date	Engineer	Stream	Location	Width	Area of Section	Mean Velocity	Discharge
				Feet	Sq. ft.	Ft. per sec.	Sec.-ft.
Sept. 18....	C. McGavin....	Bear creek.....	NW. 16-81-6-6...	9	4.5	.....	Nil
Sept. 18....	do	Big Rat creek.....	NW. 11-80-5-6...	9	3.4	0.37	1.26
Oct. 5....	do	Burnt river.....	SE. 7-80-1-6....	9	2.3	0.34	0.78
Sept. 19....	do	Montagneuse river..	NW. 31-83-6-6....	8	2.6	0.80	2.10
May 22....	H. S. Kerby.....	Patch creek.....	SW. 32-83-21-5..	16	16.0	1.63	26.00
July 8....	P. H. Daniels....	do	do	18	16.0	2.01	33.00
Jan. 27....	do	Red river.....	Tp. 108-5-5.....	60	81.0	0.12	9.90
Sept. 27....	C. McGavin....	Spirit river.....	NW. 12-78-6-5....	9	6.8	.....	Nil
Jan. 21-22	P. H. Daniels....	Wabiskaw river....	Nr. Vermilion, Tp. 108-9-5 ..	254	431.0	0.73	317.00
Feb. 29—							
Mar. 1—..	do	do	do	254	376.0	0.91	343.00

ATHABASKA RIVER DRAINAGE BASIN

General Description

Athabaska river rises on the eastern slope of the Rocky mountains and flows in a north-easterly direction for about one thousand miles, eventually emptying into lake Athabaska.

The Athabaska basin forms the most southerly portion of the great MacKenzie system and the portion dealt with in this report comprises the headwaters only.

Rising in a country very similar to the watershed of the other streams of importance in Alberta, it flows out of the mountains and then through the foot-hill country. From the foot-hills to the lake the basin consists of stretches of muskeg and uplands, well timbered with spruce and pine.

The general character of the basin is such that the winter precipitation or snow cover is conserved to a great extent and floods in the early spring are not usual. However, in June, July and August rains and warm winds cause the upper parts of the system to discharge large quantities of snow water from the higher peaks and glaciers, and when rains of any magnitude occur the invariable result is a flood. The muskeg country is a great source of storage, but when its capacity is reached, it accelerates rather than retards the run-off.

The main transcontinental lines of the Grand Trunk Pacific and the Canadian Northern railways cross the upper portion of this drainage basin, and transportation is now a much easier problem than in the past.

Many valuable deposits of coal, limestone and other minerals are found in this basin, and, on account of these as well as the many power possibilities, and stretches of timber and pulpwood, it is expected that great developments will take place during the next few years.

A fuller description of this drainage basin was published as an appendix to the 1913 report, and a special report upon the floods in this drainage basin was published in an appendix to the 1915 report.

MIETTE RIVER NEAR JASPER

Location.—On the SW. $\frac{1}{4}$ Sec. 9, Tp. 45, Rge. 1, W. 6th Mer., at a traffic bridge about two miles southwest of Jasper and about one mile from the mouth of the river.

Records available.—May 23, 1914, to December 31, 1916. Discharge measurements during 1913 and winter of 1914.

Gauge.—Vertical staff, on downstream side of bridge pier, about twenty feet from the left bank and maintained at zero elevation of 3,383.41 feet since establishment.

Bench-marks.—Six-inch spike driven in fifteen-inch spruce tree on the left bank of the river and about thirty feet east of the gauge; elevation 3,395.17 feet (Grand Trunk Pacific railway).

Channel.—One channel divided by two bridge piers at all stages; slightly shifting.

Discharge measurements.—Made from the bridge.

Winter flow.—River affected by ice from November to April. Discharge measurements made at a point about 1,000 feet down stream from regular section, during winter.

Observer.—A. B. Webb.

DISCHARGE MEASUREMENTS of Miette river near Jasper, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 18.....	R. J. McGuinness.....	37.0	59.0	0.30	1.04	17.3
Jan. 25.....	do.....	37.0	52.0	0.28	0.84	14.7
Feb. 14.....	do.....	42.0	73.4	0.32	1.00	23.0
Mar. 28.....	do.....	42.0	87.2	0.44	2.00	38.0
April 10.....	do.....	72.0	193.0	0.44	1.65	86.0
May 8.....	do.....	75.0	334.0	1.22	2.71	407.0
May 30.....	C. McGavin.....	76.2	377.0	1.34	3.16	507.0
June 20.....	do.....	76.0	1,088.0	2.88	12.00	3,128.0 \pm
June 22.....	do.....	75.9	958.0	2.58	9.72	2,471.0 \pm
July 15.....	do.....	75.9	675.0	1.85	6.02	1,249.0
Aug. 6.....	do.....	76.1	530.0	1.50	4.64	795.0
Aug. 29.....	do.....	75.9	453.0	1.09	3.42	494.0
Sept. 18.....	W. T. Reeve.....	75.9	337.0	0.66	2.40	222.0
Oct. 13.....	do.....	75.9	325.0	0.59	2.16	192.0
Nov. 14.....	do.....	69.0	138.7	0.66	2.45	91.0
Dec. 4.....	do.....	67.0	98.8	0.78	1.96	77.0

 \pm Slope measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Miette river near Jasper, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	1.26	38b	1.04	10	1.60	32	2.10	40	2.00	288	2.89	449
2.....	1.18	35	1.24	12	1.50	23	2.22	43	2.20	320	3.04	481
3.....	1.15	30	1.34	15	1.40	18	2.25	45	2.40	354	2.94	459
4.....	1.00	20	1.74	17	1.25	22	2.45	50	3.00	472	4.70	885
5.....	1.10	30	1.74	20	1.30	27	2.35	83	3.20	516	4.20	754
6.....	1.00	25	1.54	22	1.40	27	2.37	117	3.50	583	3.90	679
7.....	0.90	25	1.54	21	1.45	25	2.20	106	3.60	606	3.60	606
8.....	1.00	28	1.24	18	1.50	27	2.05	100	2.60	390	3.75	642
9.....	0.90	25	1.04	16	1.55	30	2.00	98	2.40	354	3.90	679
10.....	0.50	23	0.74	15	2.35	34	1.65	86	2.15	312	3.66	620
11.....	0.74	24	1.24	16	2.40	36	1.17	86	2.00	288	3.36	551
12.....	0.64	24	1.74	18	2.55	38	1.13	87	1.99	286	3.96	694
13.....	0.84	23	2.24	21	2.75	39	1.05	92	1.69	247	4.36	794
14.....	0.94	22	1.04	23	2.80	38	1.00	96	1.64	241	5.71	1,165
15.....	1.04	20	1.60	25	2.85	37	1.10	103b	1.58	234	5.96	1,235
16.....	1.09	20	1.58	27	2.70	36	0.77	157	1.43	216	9.37	2,295
17.....	0.94	18	1.60	29	2.65	36	0.80	159	1.48	222	9.97	2,487
18.....	1.04	17	1.45	33	2.50	36	0.75	156	1.98	285	10.47	2,647
19.....	1.24	16	2.00	35	2.32	35	0.73	154	2.92	455	10.97	2,807
20.....	1.14	15	2.25	37	2.30	35	0.70	152	2.97	466	11.97	3,127
21.....	1.17	15	2.30	40	2.24	35	0.69	151	2.97	466	11.27	2,903
22.....	1.19	15	2.48	39	2.20	35	0.67	150	2.57	385	9.73	2,411
23.....	1.21	15	2.45	38	2.15	36	0.60	146	2.61	392	9.48	2,331
24.....	1.24	15	2.40	38	2.10	37	0.65	149	2.66	402	9.03	2,187
25.....	1.34	15	2.30	39	2.05	38	0.63	148	2.81	432	8.98	2,171
26.....	1.44	11	2.25	40	2.00	38	1.00	173	2.85	440	8.68	2,075
27.....	1.74	10	2.00	39	2.00	38	1.75	254	3.70	630	9.48	2,331
28.....	1.94	5	1.90	37	1.78	38	1.68	246	3.45	572	9.03	2,187
29.....	1.44	4	1.70	35	1.82	35	1.55	230	3.25	527	8.98	2,171
30.....	1.09	5	.....	.....	1.98	38	1.45	218	3.16	507	8.58	2,043
31.....	0.99	6	.....	.....	2.00	38	.....	.....	3.09	492	.....	.....

b Ice conditions from January 1 to April 15.

SESSIONAL PAPER No. 25a

DAILY GAUGE HEIGHT AND DISCHARGE of Miette river near Jasper, for 1916—*Concluded*

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	8.28	1,947	4.98	893	4.17	668	1.97	173	1.96	172	1.97	86
2....	6.98	1,535	5.30	974	4.57	780	1.87	163	2.00	176	1.95	83
3....	7.78	1,787	6.61	1,336	4.22	682	1.82	158	2.00	176	1.95	80
4....	7.93	1,835	5.20	939	4.42	738	1.84	160	1.96	172	1.96	77
5....	6.98	1,535	5.05	898	4.57	780	1.87	163	1.96	172	1.78	74
6....	5.93	1,226	4.64 ^s	799	3.72	547	1.97	173	2.00	176	1.80	70
7....	5.73	1,170	4.84	855	3.42	469	1.89	165	1.97	173	1.82	64
8....	5.75	1,176	4.95	886	3.22	417	1.87	163	1.91	167	1.80	58
9....	6.28	1,324	4.90	872	3.27	430	1.87	163	1.91	167	1.85	54
10....	8.53	2,027	4.86	861	3.12	392	1.84	160	1.96	125	1.89	52
11....	8.48	2,011	4.86	861	2.97	355	1.97	173	2.06	84	1.90	52
12....	8.61	2,052	4.72	822	2.92	344	2.07	185	2.26	85	1.90	52
13....	9.98	2,491	4.71	819	2.52	256	2.16	197	2.36	88	2.03	53
14....	6.80	1,479	4.88	866	2.27	212	2.52	256	2.47	91	2.05	54
15....	4.24	764	5.19	955	2.47	246	2.97	355	2.40	94	2.03	55
16....	6.08 ^s	1,268	5.54	1,057	2.47	246	4.07	641	2.30	95	2.00	55
17....	6.88	1,494	4.90	872	4.39	729	5.37	1,007	2.30	98	1.90	56
18....	6.54	1,388	4.10	649	4.39	729	4.96	889	2.15	102	1.89	55
19....	7.97	1,828	3.19	410	4.32	710	3.26	428	2.10	104	1.91	55
20....	7.31	1,615	3.02	367	4.32	710	3.16	402	2.05	107	1.91	55
21....	6.95	1,498	2.72	298	2.97	355	2.96	353	2.00	107	1.90	54
22....	6.15	1,260	2.93	346	3.72	547	2.56	264	2.00	103	1.90	52
23....	5.39	1,042	3.48	485	2.17	198	2.46	244	1.80	87	1.91	48
24....	5.03	939	3.59	513	2.22	205	2.41	234	2.00	87	1.91	44
25....	5.43	1,044	3.35	451	2.25	210	2.38	229	2.05	89	1.86	36
26....	5.92	1,179	3.35	451	2.25	210	2.26	211	2.08	90	1.86	30
27....	5.36	1,016	3.41	467	2.17	198	2.11	190	2.05	91	1.91	28
28....	5.11	944	3.41	467	2.12	192	1.99	175	2.00	91	1.99	27
29....	5.25	977	3.42	469	1.97	173	1.99	175	1.95	90	2.01	25
30....	4.89	877	3.62	521	2.02	179	1.96	172	1.98	88	2.06	30
31....	4.79	844	3.72	547	.....	.....	1.97	173	.....	.....	2.07	32

^s Shifting conditions, July 16 to August 6.

MONTHLY DISCHARGE of Miette river near Jasper, for 1916

(Drainage area 250 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	38	4	19.2	0.077	0.09	1,181
February.....	40	10	27.0	0.108	0.12	1,553
March.....	39	18	33.0	0.132	0.15	2,029
April.....	254	40	129.0	0.516	0.58	7,676
May.....	630	216	399.0	1.596	1.84	24,534
June.....	3,127	449	1,562.0	6.248	6.97	92,945
July.....	2,491	764	1,406.0	5.624	6.48	86,452
August.....	1,336	298	710.0	2.840	3.27	43,656
September.....	780	173	430.0	1.720	1.92	25,587
October.....	1,007	158	277.0	1.108	1.28	17,032
November.....	176	84	118.0	0.472	0.53	7,021
December.....	86	27	53.0	0.212	0.24	3,259
The year.....					23.47	312,925

ATHABASKA RIVER AT JASPER

Location.—On the NW. $\frac{1}{4}$ Sec. 15, Tp. 45, Rge. 1, W. 6th Mer., about one-half mile east of the Grand Trunk Pacific railway station and three-quarters of a mile below the mouth of Miette river.

Records available.—March 4, 1913, to December 31, 1916.

Gauge.—Vertical staff, on left bank and 350 feet below cable.

Elevation of zero was maintained at 3,360.70 feet during 1913.

Elevation of zero was maintained at 3,360.68 feet during 1914-16.

Bench-mark.—Permanent iron bench-mark, fifty feet south of gauge; elevation 3,376.85 feet (Grand Trunk Pacific railway datum).

Channel.—Shifting.

Discharge measurements.—Made from a cable car.

Winter flow.—River affected by ice from November to April.

Observer.—A. B. Webb.

Accuracy.—Gauge heights were read at this station to one-hundredth of a foot, at approximately the same hour daily and are well within the required degree of accuracy.

The open water curve is well defined and regular, and passes through or very close to all of the discharge measurement points and very closely approaches exactitude.

The winter discharges are taken from a graph which was based on several winter discharge measurements, daily gauge height records and temperature records, and is fairly accurate.

DISCHARGE MEASUREMENTS of Athabaska river at Jasper, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 17.....	R. J. McGuinness.....	110	404	0.35	6.21	142
Jan. 24.....	do.....	110	384	0.35	6.01	134
Feb. 19.....	do.....	136	217	2.36	8.00	510
Mar. 30.....	do.....	120	128	3.63	0.55	465
April 10.....	do.....	145	145	5.07	1.03	734
May 2.....	do.....	224	341	5.20	2.62	1,772
June 2.....	C. H. McGavin.....	228	345	5.31	2.73	1,834
June 24.....	do.....	415	2,090	6.86	8.70	14,275
June 24.....	do.....	415	2,090	6.87	8.70	14,361 \times
July 13.....	do.....	420	2,650	8.17	9.92	21,661
Aug. 3.....	do.....	414	1,580	6.39	7.66	10,101
Aug. 28.....	W. T. Reeve.....	371	1,162	6.19	6.56	7,194
Sept. 16.....	do.....	210	646	5.09	4.01	3,206
Oct. 14.....	do.....	184	332	4.74	2.70	1,573
Nov. 16.....	do.....	.....	.....	.....	1.86	980 ^e
Dec. 5.....	do.....	156	223	3.07	1.57	685

^e Discharge estimated from gauge height and velocity.

\times Slope measurement.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Athabaska river at Jasper, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	3.07 ^b	530	5.36	315	5.90	450	0.64	505	1.88	1,140	2.66	1,668
2....	2.87	530	7.01	330	6.10	470	0.69	530	2.23	1,341	2.73	1,727
3....	2.97	525	9.21	355	6.00	480	0.72	542	2.58	1,604	2.97	1,950
4....	2.47	475	9.01	370	5.80	490	0.89	576	2.88	1,862	3.75	2,780
5....	3.68	440	8.61	390	5.70	490	0.86	605	2.98	1,960	3.63	2,643
6....	3.98	470	8.51	400	4.00	480	0.91	642	3.13	2,110	3.35	2,335
7....	2.58	490	8.01	410	4.50	470	0.99	698	3.18	2,160	3.40	2,390
8....	2.68	425	8.01	415	3.30	455	1.02	720	2.62	1,636	3.55	2,555
9....	4.99	385	8.21	420	3.20	450	1.04	727	2.32	1,404	3.73	2,766
10....	5.39	370	8.11	430	2.00	440	1.03 ^b	734	2.17	1,302	3.45	2,445
11....	5.99	335	8.01	440	1.90	440	0.98	744	1.97	1,185	3.32	2,302
12....	6.19	310	7.71	455	1.50	435	0.83	699	1.87	1,135	3.77	2,804
13....	6.20	275	8.51	460	1.00	430	0.88	714	1.82	1,110	3.95	3,020
14....	6.30	210	8.31	470	0.90	430	0.91	723	1.82	1,110	4.65	3,930
15....	6.20	180	8.01	480	0.80	430	0.98	744	1.84	1,120	4.95	4,350
16....	6.30	155	7.99	490	0.69	430	0.98	744	1.87	1,135	7.50	9,630
17....	6.21	142	8.01	500	0.64	430	1.00	750	1.97	1,185	8.80	14,840
18....	6.11	140	7.61	510	0.54	435	1.01	754	2.27	1,369	9.20	17,020
19....	5.71	140	8.00	510	0.44	435	1.03	762	2.70	1,700	9.80	20,790
20....	5.41	140	8.20	515	0.39	440	1.08	782	2.91	1,890	9.81	20,856
21....	5.56 ^a	140	7.00	510	0.44	445	1.06	774	2.96	1,940	9.20	17,020
22....	5.71 ^a	135	6.70	510	0.51	450	0.98	744	2.51	1,548	9.00	15,900
23....	5.86 ^a	135	6.00	510	0.53	455	0.93	729	2.56	1,588	8.90	15,360
24....	6.01	134	6.00	500	0.49	460	0.98	744	2.41	1,468	8.70	14,340
25....	6.41	135	5.70	495	0.54	460	0.76	678	2.46	1,508	8.40	12,920
26....	6.21	140	5.50	480	0.54	460	1.23	842	2.59	1,612	8.39	12,877
27....	6.01	160	5.00	470	0.52	465	1.68	1,040	2.96	1,940	8.79	14,790
28....	5.71	180	5.10	455	0.55	465	1.87	1,135	3.06	2,040	8.68	14,242
29....	5.51	205	5.50	445	0.57	465	1.58	990	2.96	1,940	8.68	14,242
30....	5.21	235	.....	.....	0.59	465	1.38	902	2.84	1,826	8.18	12,002
31....	5.16	280	.....	.....	0.61	488	.....	.....	2.82	1,808	.....	.....

^a Gauge heights interpolated.^b Ice conditions, January 1 to April 10

DAILY GAUGE HEIGHT AND DISCHARGE of Athabaska river at Jasper, for 1916—Concluded

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	7.97	11,212	7.08	8,450	6.97	8,178	3.05	2,030	2.40	1,460	1.41	750
2....	7.86	10,820	7.53	9,723	7.57	9,847	2.95	1,930	2.45	1,500	1.36	730
3....	7.52	9,692	7.66	10,138	7.47	9,540	2.75	1,745	2.50	1,540	1.41	715
4....	7.96	11,176	7.06	8,400	7.27	8,956	2.80	1,790	2.55	1,580	1.44	695
5....	7.61	9,973	6.42	6,894	6.97	8,178	2.94	1,920	2.55	1,580	1.57	685
6....	6.54	7,162	6.42	6,894	6.77	7,698	3.04	2,020	2.50	1,540	1.37	675
7....	6.43	6,916	7.06	8,400	6.57	7,231	2.69	1,692	2.45	1,500	1.32	670
8....	6.49	7,048	7.16	8,656	4.97	4,378	2.71	1,709	2.00	1,200	1.34	665
9....	7.43	9,420	7.79	10,576	5.47	5,152	2.69	1,692	1.91	1,155	1.22	660
10....	8.93	15,522	7.56	9,816	5.12	4,600	2.69	1,692	1.89 ^b	1,050	1.43	655
11....	8.88	15,256	6.13	6,297	4.72	4,028	2.63	1,644	1.41	900	1.83	653
12....	8.93	15,522	5.98	6,024	4.47	3,681	2.75	1,745	1.46	920	1.86	650
13....	9.95	21,780	5.93	5,934	4.22	3,356	2.73	1,727	1.56	950	2.53	648
14....	8.90	15,360	6.79	7,746	3.97	3,044	2.70	1,700	1.61	950	2.63	645
15....	7.43	9,420	7.35	9,195	3.97	3,044	3.20	2,180	1.81	960	3.04	640
16....	6.97	8,178	7.95	11,140	4.01	3,092	4.15	3,265	1.86	980	2.44	635
17....	8.91	15,414	6.34	6,718	4.07	3,164	5.80	5,710	1.81	985	2.42	632
18....	7.95	11,140	6.14	6,316	4.12	3,226	5.00	4,420	1.86	985	2.44	628
19....	8.39	12,877	5.75	5,625	4.12	3,226	4.00	3,080	1.91	980	2.49	625
20....	7.94	11,104	5.05	4,495	4.17	3,291	3.90	2,960	1.91	960	2.54	623
21....	6.97	8,178	5.15	4,645	4.17	3,291	3.50	2,500	1.88	940	2.63	620
22....	6.71	7,554	5.05	4,495	4.06	3,152	3.20	2,180	1.86	900	2.65	600
23....	6.38	6,806	5.70	5,540	4.01	3,082	3.15	2,130	1.76	870	2.70	560
24....	6.93	8,082	6.06	6,168	4.26	3,408	3.05	2,030	1.77	860	2.75	520
25....	7.48	9,570	6.76	7,674	4.16	3,278	3.00	1,980	1.68	840	2.65	450
26....	7.36	9,214	6.51	7,093	4.11	3,213	2.92	1,900	1.71	820	4.05	440
27....	7.11	8,526	6.66	7,438	3.45	2,445	2.78	1,772	1.71	810	4.51	440
28....	7.02	8,300	6.56	7,208	3.37	2,357	2.75	1,745	1.66	800	5.06	440
29....	6.67	7,461	6.17	6,373	3.20	2,180	2.60	1,620	1.56	785	8.06 ^a	440
30....	6.07	6,186	6.37	6,784	3.10	2,080	2.43	1,484	1.51	770	8.18 ^a	445
31....	6.87	7,938	6.62	7,346	.....	.....	2.40	1,460	.....	.....	6.66 ^b	448

^a Gauge heights interpolated.^b Ice conditions, November 10 to December 31.

MONTHLY DISCHARGE of Athabaska river at Jasper, for 1916

(Drainage area 1576 square miles)

MONTH	DISCHARGE IN SECOND-FeET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	530	134	276	0.175	0.20	16,971
February.....	515	315	450	0.286	0.31	25,884
March.....	490	430	454	0.288	0.33	27,915
April.....	1,135	505	742	0.471	0.53	44,152
May.....	2,160	1,110	1,570	0.996	1.15	96,535
June.....	20,856	1,668	8,889	5.636	6.29	528,575
July.....	15,522	6,186	10,413	6.607	7.62	640,270
August.....	11,140	4,495	7,361	4.671	5.38	452,610
September.....	9,847	2,080	4,514	2.864	3.20	208,602
October.....	5,710	1,460	2,176	1.381	1.59	133,797
November.....	1,580	770	1,069	0.678	0.76	63,610
December.....	750	440	603	0.383	0.44	37,977
The year.....	.....	.....	.....	.....	27.80	2,335,998

MALIGNE RIVER NEAR JASPER

Location.—On the SW. $\frac{1}{4}$ Sec. 1, Tp. 46, Rge. 1, W. 6th Mer., about four and one-half miles north-east of Jasper and about 400 feet from the confluence of the Maligne and Athabaska rivers.

Records available.—Discharge measurements from June 29, 1914, to December 31, 1916. Gauge heights were obtained from June 3, 1916, to November 15, 1916.

Gauge.—Vertical staff; also a Stevens continuous water stage recorder was installed on right bank about 100 feet up stream from cable tower on June 3, 1916.

Zero elevation of both gauges maintained at 91.62 feet since establishment.

Bench-mark.—Permanent iron bench-mark on right bank, about eighty feet from cable support; assumed elevation 99.53 feet.

Channel.—One channel at all stages; shifts during high stages.

Discharge measurements.—Made from a cable.

Winter flow.—Not affected by ice.

Accuracy.—The daily discharges computed are based on the mean daily gauge heights taken from the automatic gauge records and are well within the required degree of accuracy.

The open water discharge curves of which there are two, one previous and one subsequent to high water, pass through or very close to all the points except during high water when shifting conditions prevailed owing to the instability of the control, between July 15 and August 26. The results are within the maximum limit of error. No daily discharges were computed during the winter as the automatic gauge could not be used and the services of an observer were not obtainable.

DISCHARGE MEASUREMENTS of Maligne river near Jasper, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height		Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Staff ft.</i>	<i>Auto. ft.</i>	
Jan. 20.....	R. J. McGuinness	64	72	1.59	0.40	.....	114
Feb. 17.....	do	62	69	1.44	0.10	.....	99
April 1.....	do	64	69	1.47	0.60	.....	102
April 18.....	do	63	62	1.51	0.50	.....	94
May 9.....	C. McGavin.....	69	92	2.20	1.13	.....	202
May 29.....	do	73	130	3.20	1.64	.....	413
June 1.....	do	74	121	3.03	1.63	.....	367
June 23.....	do	91	265	6.30	3.59	3.61	1667
June 23.....	do	91	265	6.29	3.59	.....	1664 _z
July 15.....	do	100	375	8.52	4.80	4.81	3197 _z
Aug. 4.....	do	94	272	6.20	3.78	3.78	1690 _s
Aug. 26.....	do	96	252	6.09	3.84	3.80	1534 _s
Sept. 17.....	do	89	252	6.02	3.65	3.74	1519
Oct. 16.....	W. T. Reeve.....	78	146	3.52	2.56	2.56	541
Nov. 15.....	do	76	103	2.38	1.85	1.90	246
Dec. 6.....	do	71	80	2.16	1.56	.....	173

_s Slope measurement.

_z Shifting conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Maligne river near Jasper, for 1916

Day	June		July		August		September		October		November	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....			3.44	1,508	3.78	1,684	3.79	1,540	3.57	1,326	2.26	382
2....			3.45	1,517	3.79	1,684	3.81	1,561	3.48	1,242	2.23	368
3....			3.46	1,526	3.81	1,694	3.81	1,561	3.39	1,164	2.16	337
4....	1.90	496	3.59	1,645	3.82	1,694	3.81	1,561	3.30	1,088	2.18	346
5....	1.92	506	3.49	1,551	3.82	1,684	3.82	1,572	3.13	950	2.19	350
6....	1.94	516	3.45	1,517	3.81	1,664	3.81	1,561	2.94	802	2.14	329
7....	1.93	511	3.43	1,500	3.81	1,664	3.80	1,550	2.74	658	2.04	290
8....	1.94	516	3.47	1,534	3.81	1,654	3.79	1,540	2.62	578	2.05	294
9....	1.97	531	3.62	1,674	3.81	1,645	3.79	1,540	2.48	494	1.98	270
10....	1.98	536	3.86	1,926	3.80	1,635	3.79	1,540	2.41	456	1.90	245
11....	1.99	541	4.08	2,185	3.79	1,616	3.78	1,530	2.28	391	2.05	294
12....	2.04	566	4.32	2,501	3.78	1,598	3.77	1,520	2.28	391	1.97	267
13....	2.10	597	4.65	2,966	3.79	1,607	3.77	1,520	2.37	435	1.95	261
14....	2.30	705	4.90	3,326	3.79	1,598	3.77	1,520	2.42	461	1.96	264
15....	2.62	899	4.79	3,197s	3.81	1,607	3.76	1,510	2.42	461	1.90	245
16....	3.09	1,223	4.68	2,995	3.82	1,616	3.75	1,500	2.54	529		
17....	3.38	1,457	4.70	3,009	3.80	1,588	3.73	1,480	2.75	665		
18....	3.57	1,626	4.70	3,052	3.80	1,579	3.71	1,460	2.85	736		
19....	3.82	1,882	4.67	2,937	3.80	1,579	3.68	1,431	2.87	750		
20....	3.82	1,882	4.60	2,822	3.80	1,569	3.67	1,421	2.85	736		
21....	3.74	1,796	4.43	2,569	3.79	1,551	3.66	1,412	2.83	722		
22....	3.66	1,714	4.27	2,340	3.78	1,543	3.65	1,402	2.79	693		
23....	3.62	1,674	4.14	2,160	3.80	1,551	3.63	1,383	2.73	651		
24....	3.57	1,626	3.99	1,982	3.80	1,543	3.61	1,364	2.69	624		
25....	3.54	1,598	3.95	1,926	3.79	1,534	3.60	1,354	2.64	591		
26....	3.56	1,616	3.94	1,904	3.80	1,534s	3.59	1,345	2.58	553		
27....	3.57	1,626	3.89	1,839	3.80	1,550	3.59	1,345	2.50	505		
28....	3.54	1,598	3.87	1,807	3.79	1,540	3.58	1,335	2.42	461		
29....	3.49	1,551	3.85	1,775	3.78	1,530	3.57	1,326	2.37	435		
30....	3.47	1,534	3.82	1,744	3.78	1,530	3.57	1,326	2.32	410		
31....			3.81	1,734	3.78	1,530			2.28	391		

s Shifting conditions July 15 to August 26.

MONTHLY DISCHARGE of Maligne river near Jasper, for 1916

(Drainage area 455 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
June (4-30).....	1,882	496	1,160	2.549	2.56	62,118
July.....	3,326	1,500	2,150	4.725	5.45	132,200
August.....	1,694	1,530	1,600	3.516	4.05	98,380
September.....	1,572	1,326	1,467	3.224	3.60	87,293
October.....	1,326	391	656	1.442	1.66	40,336
November (1-15).....	382	245	303	0.666	0.37	9,015
The period.....					17.69	429,342

ROCKY RIVER AT HAWES

Location.—On the NE. $\frac{1}{4}$ Sec. 14, Tp. 48, Rge. 2S, W. 5th Mer., about three-quarters of a mile east of Hawes station, and about three hundred yards from the point where the Rocky river enters the Athabaska river.

Records available.—June 9, 1913, to December 31, 1916.

Gauge.—Vertical staff on right bank of river and under Grand Trunk Pacific railway bridge; datum maintained at 3,273.81 feet since establishment.

Bench-mark.—On the NW. corner of concrete pier and ten feet from gauge; elevation 3,282.90 feet (Grand Trunk Pacific railway datum).

Discharge measurements.—Made from a bridge.

Winter flow.—River affected by ice from November to April. Discharge measurements made at a point about one mile above station.

Observer.—C. G. Smith.

DISCHARGE MEASUREMENTS of Rocky river at Hawes, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 3.....	R. J. McGuinness.....	30.0	11.00	1.10	1.24	12.1
Jan. 30.....	do.....	40.0	25.00	0.38	5.24	9.6
April 4.....	do.....	30.0	30.25	4.73	1.15	143.0
April 20.....	do.....	38.0	42.40	1.79	0.97	76.0
May 15.....	C. H. McGavin.....	58.5	73.47	2.32	1.46	171.0
June 5.....	do.....	99.0	146.00	4.77	2.50	699.0
June 27.....	do.....	153.6	369.00	5.50	4.46	2,029.0
July 17.....	do.....	107.0	383.00	4.70	3.28	1,798.0
Aug. 5.....	do.....	101.0	230.00	5.97	2.97	1,377.0
Sept. 21.....	W. T. Reeve.....	106.0	135.00	3.42	1.96	461.0
Oct. 20.....	do.....	105.0	158.60	4.68	2.30	744.0
Nov. 17.....	do.....	53.0	74.15	2.17	2.07	161.0
Dec. 8.....	do.....	45.0	34.65	1.41	2.04	49.0

DAILY GAUGE HEIGHT AND DISCHARGE of Rocky river at Hawes, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	1.50 ^b	15	5.95	14	0.65	56	0.92	122	1.53	195	2.17	484
2....	1.39 ^a	14	5.77	14	0.77	57	1.05	129	1.63	239	2.19	495
3....	1.28	12	5.50	15	1.15	58	1.10	137	1.92	355	2.23	518
4....	2.50	14	5.67	16	1.35	58	1.15	143	2.13	463	2.66	831
5....	4.00	15	5.46	16	1.70	58	1.05	130	2.08	437	2.45	664
6....	3.50	17	4.70	16	1.82	58	1.30	164	2.06	426	2.39	621
7....	3.45	17	4.45	17	1.90	60	1.45	186	2.05	421	2.38	614
8....	3.00	16	4.05	18	3.20	60	1.70	220	2.03	411	2.40	628
9....	2.50	14	3.80	20	5.06	61	2.90	230	1.96	375	2.43	650
10....	2.50	13	4.21 ^a	22	5.72	62	1.85	210	1.68	250	2.45	664
11....	2.30	11	4.62 ^a	26	5.70	64	1.06	135	1.69	254	2.39	621
12....	2.50	10	5.03 ^a	30	5.76	64	1.05	130	1.55	202	2.41	635
13....	4.00	10	5.44 ^a	33	5.66	66	1.10	110	1.54	199	2.50	700
14....	3.00	10	5.85 ^a	36	4.95	68	1.25	100	1.50	185	2.72	882
15....	2.90	11	6.20 ^a	38	5.00	69	1.08 ^b	88	1.44	166	4.09	2,350
16....	2.80	13	6.22	40	5.40	70	1.12	94	1.44	166	4.36	2,690 ^s
17....	4.70	14	6.12	40	5.65	71	1.05	85	1.52	192	4.69	3,040
18....	4.80	16	6.05	40	5.70	72	1.00	80	1.67	247	5.08	3,440
19....	4.90	18	6.06	41	5.60	74	1.00	80	1.82	309	5.26	3,590
20....	5.60	18	6.05	42	5.55	76	0.97	77	2.13	463	5.24	3,500
21....	5.00	14	5.35	44	5.60	78	0.93	74	2.09	442	4.95	3,050
22....	4.20	12	5.19	44	5.52	80	0.90	71	2.03	411	4.62	2,580
23....	3.80	10	5.15	46	5.40	82	0.92	73	1.92	355	4.44	2,290
24....	3.40	8	5.03	48	4.00	84	0.95	76	1.87	332	4.47	2,250
25....	3.30	8	4.36	49	2.01	86	0.94	75	1.87	332	4.45	2,160
26....	3.30	6	4.68	50	1.05	87	1.05	85	1.86	327	4.45	2,090
27....	4.00	6	4.08	51	1.01	90	1.33	136	1.93	360	4.54	2,130
28....	5.80	6	4.63	52	1.00	96	1.45	169	2.19	495	4.69	2,350
29....	4.00	8	4.20	54	0.95	102	1.37	146	2.22	512	4.57	2,260
30....	5.90	10	.....	.....	1.00	108	1.31	130	2.20	500	4.44	2,160 ^s
31....	6.15	12	.....	.....	0.95	114	.....	.....	2.18	490	.....	.....

^a Gauge height interpolated.^b Ice conditions January 1 to April 15.^s Shifting conditions June 16 to June 30.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Rocky river at Hawes, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	4.36	2,140s	2.94	1,384	2.62	1,049	1.91	421	1.82	360	2.51	100
2....	4.35	2,170	2.98	1,427	2.75	1,184	1.88	400	1.84	373	2.36	78
3....	4.44	2,340	3.07	1,524	2.75	1,184	1.85	380	1.81	354	2.06	57
4....	4.68	2,700	3.01	1,459	2.92	1,362	1.83	367	1.77	329	2.16	50
5....	4.14	2,100	2.93	1,373	3.20	1,668	1.83	367	1.77	329	2.46	49
6....	3.75	1,720	2.83	1,268	3.07	1,524	1.81	354	1.73	306	1.99	47
7....	3.49	1,480	2.81	1,246	2.90	1,341	1.80	347	1.68	277	2.07	48
8....	3.40	1,440	2.83	1,268	2.72	1,152	1.77	329	1.65	262	2.04	49
9....	3.38	1,470	2.99	1,437	2.61	1,038	1.75	318	1.61	240	2.12	50
10....	3.38	1,520	2.91	1,352	2.56	988	1.75	318	1.57b	210	2.32	51
11....	3.31	1,500	2.68	1,110	2.50	927	1.75	318	1.49	176	2.35	52
12....	3.42	1,680	2.58	1,008	2.42	850	1.78	335	1.47	172	2.30	53
13....	3.40	1,710	2.53	957	2.32	757	1.84	373	1.45	168	2.60	55
14....	3.20	1,540	2.48	908	2.22	668	1.92	428	1.43	164	3.00	57
15....	3.12	1,520	2.58	1,008	2.17	625	2.00	490	1.43	162	2.90	58
16....	3.10	1,556s	2.69	1,121	2.15	608	2.41	841	1.41	160	2.60	59
17....	3.33	1,815	2.87	1,310	2.13	592	3.09	1,545	2.19	161	3.30	60
18....	3.39	1,883	3.02	1,470	2.11	575	2.85	1,288	2.17	171	4.03	64
19....	3.14	1,605	2.97	1,416	2.08	552	2.51	937	2.15	177	4.00	66
20....	3.08	1,534	2.84	1,278	2.02	505	2.32	757	2.14	179	3.20	66
21....	2.96	1,405	2.70	1,131	1.97	467	2.16	617	2.18	178	3.00	64
22....	2.90	1,341	2.65	1,080	1.95	452	2.09	559	2.04	166	2.85	61
23....	2.87	1,310	2.66	1,091	1.95	452	2.07	544	1.89	143	2.20	58
24....	2.76	1,194	2.92	1,362	1.94	444	2.03	513	1.78	125	2.30	57
25....	2.74	1,173	2.86	1,299	1.95	452	1.98	475	1.98	122	2.28	56
26....	3.09	1,545	2.70	1,131	1.97	467	1.95	452	2.08	127	3.10	55
27....	3.33	1,815	2.64	1,069	1.94	444	1.92	428	2.60	135	4.03	55
28....	3.30	1,781	2.56	988	1.90	413	1.88	400	3.25	136	3.10	56
29....	3.15	1,612	2.53	957	1.86	387	1.89	406	3.12	126	2.85	59
30....	2.99	1,437	2.48	909	1.87	394	1.87	393	2.98	114	2.62	65
31....	2.97	1,416	2.44	869	.....	.....	1.84	373	.....	.....	3.76b	74

s. Shifting conditions July 1-16.

b Ice conditions from November 10 to December 31.

MONTHLY DISCHARGE of Rocky river at Hawes, for 1916.

(Drainage area 395 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	18	6	12	0.031	0.04	750
February.....	54	14	34	0.086	0.09	1,956
March.....	114	56	74	0.187	0.22	4,550
April.....	230	71	123	0.311	0.35	7,319
May.....	512	166	339	0.858	0.99	20,844
June.....	3,590	484	1,698	4.299	4.80	101,038
July.....	2,700	1,173	1,660	4.203	4.85	102,070
August.....	1,524	869	1,200	3.038	3.50	73,785
September.....	1,668	387	784	1.985	2.21	46,651
October.....	1,545	318	518	1.311	1.51	31,851
November.....	373	114	203	0.514	0.57	12,079
December.....	100	47	59	0.149	0.17	3,628
The year.....	.....	.....	.....	.....	19.30	406,521

SNAKE INDIAN (STONY) RIVER NEAR HAWES

Location.—On the NW. $\frac{1}{4}$ Sec. 26, Tp. 48, Rge. 28, W. 5th Mer., at the Canadian Northern railway bridge four miles west of Bedson siding and about six hundred yards above the confluence of the Snake Indian (Stony) and Athabaska rivers.

Records available.—Discharge measurements from January 5, 1914, to December 31, 1916. During 1916 gauge heights were obtained from August 8 to November 12.

Gauge.—Vertical staff on left bank of the river, attached firmly to wooden cribbing about fifteen feet above the bridge; elevation of zero was maintained at 83.88 feet.

Bench-mark.—Bench-mark is the top of upstream side of concrete abutment of bridge, left bank of river; assumed elevation 100.00 feet.

Channel.—Two channels under bridge spans. Shifting during high water.

Discharge measurements.—Made from the bridge.

Winter flow.—Affected by ice from November to April.

Observer.—J. G. Pollock.

DISCHARGE MEASUREMENTS of Snake Indian (Stony) river near Hawes, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 3.....	R. J. McGuinness.....	40	87	1.53	.....	133
Jan. 31.....	do.....	40	68	1.35	.....	93
Feb. 18.....	do.....	40	116	1.75	.....	203
April 19.....	do.....	60	208	1.03	.....	214
May 15.....	C. McGavin.....	77	249	1.47	.....	368
June 6.....	do.....	115	360	2.92	6.56	1,053
June 21.....	do.....	245	1,658	4.64	12.54	7,689 ^e
June 26.....	do.....	218	869	3.42	9.43	2,969
July 18.....	do.....	213	742	3.29	8.80	2,445
Aug. 8.....	do.....	178	565	3.70	8.21	2,092
Aug. 31.....	W. T. Reeve.....	83	423	3.15	7.43	1,333
Sept. 19.....	do.....	82	333	1.96	6.31	654
Oct. 21.....	do.....	77	326	2.03	6.13	662
Nov. 18.....	do.....	90	379	0.85	7.60	320 ^e
Dec. 9.....	do.....	76	297	0.62	6.41	185

^e Discharge estimated, from area and velocity.

^x Slope measurement.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Snake Indian (Stony) river near Hawes, for 1916

DAY	August		September		October		November	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			7.60	1,522	5.90	520	5.40	347
2.....			7.70	1,596	5.84	496	5.40	347
3.....			7.70	1,596	5.73	453	5.42	353
4.....			7.60	1,522	5.70	441	5.43	356
5.....			7.55	1,486	5.73	453	5.43	356
6.....			7.50	1,450	5.70	441	5.40	347
7.....			7.40	1,378	5.60	406	5.40	347
8.....	8.22	1,985	7.20	1,240	5.56	394	5.38	342
9.....	8.30	2,045	6.90	1,040	5.53	385	5.38	342
10.....	8.00	1,820	6.70	920	5.45	362	5.38	342
11.....	7.90	1,745	6.60	862	5.46	364	5.38	342
12.....	7.56	1,493	6.65	891	5.54	388	5.38	342
13.....	7.55	1,486	6.50	806	5.67	430		
14.....	7.70	1,596	6.40	754	5.90	520		
15.....	7.82	1,685	6.30	704	6.02	571		
16.....	7.74	1,626	6.30	704	6.20	655		
17.....	7.60	1,522	6.30	704	7.10	1,172		
18.....	7.30	1,308	6.30	704	6.73	938		
19.....	7.00	1,105	6.30	704	6.50	806		
20.....	6.90	1,040	6.30	704	6.32	714		
21.....	6.82	992	6.20	655	6.13	621		
22.....	6.90	1,040	6.20	655	6.02	571		
23.....	7.20	1,240	6.10	607	5.90	520		
24.....	7.82	1,685	6.12	617	5.86	504		
25.....	7.80	1,670	6.12	617	5.80	480		
26.....	8.00	1,820	6.10	607	5.72	449		
27.....	7.90	1,745	6.06	589	5.65	424		
28.....	7.90	1,745	6.04	580	5.62	413		
29.....	7.70	1,596	6.02	571	5.62	413		
30.....	7.50	1,450	6.00	562	5.45	362		
31.....	7.44	1,407			5.40	347		

MONTHLY DISCHARGE of Snake Indian (Stony) river near Hawes, for 1916

(Drainage area 911 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
August (8-31).....	2,045	992	1,535	1.685	1.50	73,071
September.....	1,596	562	912	1.001	1.12	54,268
October.....	1,172	347	517	0.568	0.65	31,789
November (1-12).....	356	342	347	0.381	0.17	8,259
The period.....					3.44	167,387

ATHABASKA RIVER NEAR HINTON

Location.—On the SE. $\frac{1}{4}$ Sec. 8, Tp. 51, Rge. 25, W. 5th Mer., about three miles west of the town of Hinton and just below the mouth of Prairie creek.

Records available.—Gauge heights and discharge measurements available from May 4, 1915, to December 31, 1916.

Gauges.—The summer gauge is a vertical staff on the left bank of the river and about eight hundred feet below the cable; datum maintained at 3,144.13 feet since establishment. The winter gauge is a vertical staff on the right bank of the river, just above the mouth of Happy creek, and about three miles below the summer gauge; datum maintained at 3,131.06 feet in winter 1915-16, and 3,130.22 feet in winter 1916-17.

Bench-marks.—For the summer gauge a permanent iron bench-mark is located on the left bank of the river and about fifteen feet from the gauge; elevation 3,154.02 feet (Grand Trunk Pacific railway datum). For the winter gauge a six-inch spike in a spruce stump on the right bank and about fifty feet up stream from the gauge; elevation 3,144.51 feet (Grand Trunk Pacific railway datum).

Discharge measurements.—Made from a cable.

Winter flow.—River affected by ice from November to April. Discharge measurements made near the winter gauge during the winter.

Observers.—L. A. Hoff, M. McLeod and J. H. Warner.

Accuracy.—The daily gauge heights are read to one-hundredth of a foot, at the same hour daily, and are reasonably accurate.

The discharge measurements were plotted and a curve, which was smooth and well defined, was drawn through or very close to all the points and the resulting daily discharges should be well within the limit of error.

The winter discharges are based on computations resulting from a plotting of temperatures, daily gauge heights and frequent meterings, and are fairly close estimates.

DISCHARGE MEASUREMENTS of Athabaska river near Hinton, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 4	R. J. McGuinness	210	912	0.92	3.64	843
Feb. 13	do	240	616	1.63	3.34	1,027
Feb. 21	do	240	532	1.54	3.26	820
Mar. 25	do	259	588	2.19	3.23	1,285
April 21	do	210	1,056	1.28	-0.12	1,347
May 13	C. H. McGavin	235	1,308	2.03	1.12	2,661
June 7	do	328	1,856	3.41	2.80	6,343
June 28	do	379	3,630	7.61	7.71	27,634
June 28	do	379	3,630	7.61	7.71	27,659 _x
July 19	do	378	3,384	7.61	7.17	25,766
Aug. 10	do	360	2,862	6.28	5.44	17,794
Sept. 1	W. T. Reeve	363	2,543	5.62	4.78	14,283
Sept. 22	do	315	1,844	3.48	2.81	6,428
Oct. 22	do	280	1,712	3.33	2.50	5,805
Nov. 19	do	250	1,300	1.42	2.69	1,851
Dec. 10	do	429	1,672	0.81	5.74	1,354

_x Slope measurement.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Athabaska river near Hinton, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>S.e.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	3.69 ^b	760	3.43	925	2.86	815	3.02	1,120	1.07	2,597	2.34	5,064
2....	3.67	800	3.41	925	2.88	815	3.06	1,200	1.24	2,846	2.34	5,064
3....	3.73	840	3.44	925	3.01	815	3.01	1,250	1.44	3,154	2.29	4,935
4....	3.65	843	3.43	930	2.91	815	1.01	1,330	1.68	3,572	2.58	5,724
5....	3.63	843	3.43	940	2.96	820	0.96	1,370	1.98	4,196	2.94	6,822
6....	3.60	845	3.47	945	2.91	825	0.86	1,470	2.16	4,614	3.08	7,284
7....	3.76	850	3.45	950	2.50	825	0.51	1,560	2.25	4,835	2.85	6,530
8....	3.70	850	3.37	950	2.98	845	0.24	1,630	1.87	3,957	2.84	6,498
9....	3.71	850	3.40	960	2.95	875	0.18	1,670	1.72	3,650	2.84	6,498
10....	3.60	850	3.39	975	3.51	920	0.16	1,660	1.65	3,515	2.84	6,498
11....	3.51	845	3.34	980	3.81	960	0.38	1,575	1.53	3,301	2.80	6,370
12....	3.56	845	3.32	1,000	3.83	1,045	0.57	1,400	1.33	2,982	2.67	5,983
13....	3.51	845	3.33	1,027	3.47	1,100	0.71	1,360	1.10	2,640	2.92	6,756
14....	3.48	845	3.53	1,015	3.26	1,155	0.76	1,350	1.02	2,525	3.25	7,870
15....	3.41	845	3.87	1,000	3.21	1,195	0.91	1,350	0.97	2,454	4.20	11,680
16....	3.38	850	4.05	975	3.57	1,230	1.01	1,350	0.97	2,454	5.62	18,204
17....	3.45	875	4.11	950	3.77	1,225	0.93 ^b	1,350	1.04	2,554	7.15	25,530
18....	3.42	900	3.51	910	3.25	1,220	0.96	1,350	1.30	2,936	8.00	29,610
19....	3.37	900	3.27	875	3.01	1,220	0.97	1,350	1.56	3,352	8.95	34,170
20....	3.40	890	3.41	845	3.31	1,225	1.00	1,350	1.78	3,770	9.80	38,250
21....	3.44	875	3.63	820	3.56	1,230	1.03	1,347	1.80	3,810	10.30	40,650
22....	3.42	860	4.04	820	3.26	1,250	0.96	1,350	1.85	3,915	9.35	36,090
23....	3.05	845	3.21	820	3.27	1,250	1.13	1,375	1.82	3,852	8.65	32,730
24....	3.33	845	3.85	815	3.21	1,260	1.24	1,410	1.76	3,730	8.25	30,810
25....	3.36	875	3.23	815	3.23	1,285	1.36	1,425	1.72	3,650	8.08	29,994
26....	3.39	880	3.51	815	3.31	1,330	1.38	1,620	1.72	3,650	7.85	28,890
27....	3.35	890	3.26	815	3.38	1,370	1.41	1,840	1.82	3,852	7.85	28,890
28....	3.40	900	3.06	815	3.26	1,300	1.44	2,060	2.25	4,835	7.75	28,410
29....	3.38	900	3.11	815	3.16	1,245	1.46	2,310	2.54	5,612	7.74	28,362
30....	3.34	910	.....	.....	3.18	1,256	1.52	2,460	2.59	5,752	7.48	27,114
31....	3.46	920	.....	.....	3.11	1,218	.....	.....	2.37	5,142	.....	.....

^b Ice conditions January 1 to April 17. Winter gauge was used until April 30.

DAILY GAUGE HEIGHT AND DISCHARGE of Athabaska river near Hinton, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	7.10	25,290	5.44	17,358	4.76	14,196	2.60	5,780	1.60	3,420	2.27	1,630
2....	6.69	23,322	5.45	17,405	4.84	14,564	2.58	5,724	1.47	3,202	2.29	1,580
3....	6.52	22,506	5.54	17,828	5.41	17,217	2.56	5,668	1.50	3,250	.....	1,550 ^a
4....	6.82	23,946	5.62	18,208	5.43	17,311	2.54	5,612	1.54	3,318	.....	1,500
5....	7.05	25,050	5.49	17,593	5.30	16,700	2.49	5,472	1.50	3,250	.....	1,460
6....	6.55	22,650	5.40	17,170	5.21	16,277	2.44	5,332	1.44	3,154	.....	1,420
7....	5.82	19,146	5.02	15,392	4.95	15,070	2.42	5,276	1.36	3,028	.....	1,390
8....	5.72	18,674	4.94	15,024	4.68	13,828	1.90	4,020	1.36	3,028	.....	1,370
9....	6.08	20,394	5.17	16,089	4.46	12,830	1.70	3,610	1.40	3,090	.....	1,350 ^a
10....	6.85	24,090	5.41	17,217	4.15	11,465	1.44	3,154	1.31	2,951	5.74	1,354
11....	7.32	26,346	5.73	18,721	3.51	8,839	1.40	3,090	1.28	2,906	.....	1,356 ^a
12....	7.35	26,490	4.94	15,024	3.29	8,014	1.57	3,369	1.17 ^a	2,742	.....	1,370
13....	7.72	28,266	4.77	14,242	3.21	7,726	1.67	3,553	1.06 ^a	2,582	.....	1,380
14....	8.18	30,474	4.87	14,702	3.19	7,656	1.74	3,690	0.95 ^a	2,426	.....	1,380
15....	7.65	27,930	5.01	15,346	3.11	7,384	2.02	4,286	0.84 ^a	2,274	.....	1,380
16....	6.62	22,986	5.26	16,512	3.03	7,119	2.12	4,518	0.72 ^a	2,122	.....	1,400
17....	6.65	23,130	5.51	17,687	2.97	6,921	3.34	8,198	0.60 ^a	1,980	.....	1,400
18....	7.08	25,194	4.21	11,724	3.06	7,218	4.12	11,336	0.48 ^a	1,846	.....	1,400
19....	7.08	25,194	4.66	13,736	2.92	6,756	3.82	10,072	2.69 ^a	1,851	.....	1,400
20....	6.84	24,042	4.17	11,551	2.96	6,888	3.50	8,800	2.72	1,860	.....	1,380
21....	6.18	20,874	4.00	10,820	2.96	6,888	3.07	7,251	2.74	1,875	.....	1,360
22....	5.87	19,386	3.83	10,113	2.82	6,434	2.52	5,556	2.44	1,780	.....	1,325
23....	5.34	16,888	3.84	10,154	2.82	6,434	1.92	4,064	2.34	1,540	.....	1,300
24....	4.99	15,254	4.55	13,235	2.84	6,498	1.89	3,999	2.36	1,580	.....	1,275
25....	4.83	14,518	5.01	15,346	2.82	6,434	1.92	4,064	2.34	1,650	.....	1,250 ^a
26....	5.34	16,888	5.48	17,546	2.80	6,370	2.18	4,662	2.32	1,700	4.91	1,225
27....	5.62	18,204	5.07	15,622	2.78	6,310	2.24	4,810	2.29	1,700	4.94	1,215
28....	5.67	18,439	4.12	11,336	2.80	6,370	2.07	4,401	2.30	1,700	4.90	1,215
29....	5.60	18,110	4.75	14,150	2.73	6,160	1.77	3,750	2.33	1,680	4.93	1,225
30....	5.54	17,828	4.79	14,334	2.68	6,012	1.74	3,690	2.29	1,660	4.97	1,255
31....	5.47	17,499	4.82	14,472	.....	.....	1.83	3,873	.....	.....	5.01 ^b	1,300

^a Gauge height interpolated.
^b Ice conditions November 19 to December 31.
^c Discharge estimated from winter curve; gauge height book lost by observer.

MONTHLY DISCHARGE of Athabaska river near Hinton, for 1916

(Drainage area 3,987 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January....	920	760	861	0.216	0.25	52,941
February....	1,027	815	909	0.228	0.25	52,286
March....	1,370	815	1,095	0.275	0.32	67,329
April....	2,460	1,120	1,508	0.378	0.42	89,732
May....	5,752	2,454	3,668	0.920	1.06	225,537
June....	40,650	4,935	18,576	4.659	5.20	1,105,348
July....	30,474	14,518	21,903	5.494	6.33	1,346,763
August....	18,721	10,113	15,021	3.767	4.34	923,605
September....	17,311	6,012	9,596	2.407	2.69	571,002
October....	11,336	3,090	5,183	1.300	1.50	318,690
November....	3,420	1,540	2,372	0.595	0.66	141,144
December....	1,630	1,215	1,368	0.343	0.40	84,115
The year....	.....	.....	.....	.....	23.42	4,978,492

SESSIONAL PAPER No. 25b

MCLEOD RIVER NEAR THORNTON

Location.—On the NW. $\frac{1}{4}$ Sec. 3, Tp. 54, Rge. 16, W. 5th Mer., at the Thornton ferry, about one mile down stream from the mouth of Wolf creek and about two hundred feet south of E. Smith's ranch buildings.

Records available.—Gauge heights available from May 18, 1914, to December 31, 1916. Discharge measurements available from September 26, 1913, to December 31, 1916.

Gauge.—Vertical staff for high water and slope gauge for low water, directly under the ferry cable, on the right bank of the river. Datum maintained at 2,737.64 feet since establishment.

Bench-mark.—Permanent iron bench-mark on the right bank and about fifty feet up stream from gauge. Elevation 2,749.16 feet (Grand Trunk Pacific railway datum).

Channel.—One channel at all stages, fairly permanent.

Discharge measurements.—Made from a cable car and by wading.

Winter flow.—Stream affected by ice from November to April. Discharge measurements are made at a point about 1,000 feet above regular station during the winter.

Observer.—Edward Smith.

Accuracy.—Daily gauge heights are recorded at this station to tenths of a foot once daily and are well within the required degree of accuracy.

The daily discharges are taken from a curve plotted from nine open water meterings. The curve passes through five of the points plotted, and close to the remaining points which are equally divided on each side of this curve. The resulting computations are fairly accurate and well within the limit of error.

The winter discharges are derived from a graph based upon daily gauge height records, temperatures and regular winter measurements, and are reasonably accurate.

DISCHARGE MEASUREMENTS of McLeod river near Thornton, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 5	R. J. McGuinness	120	196	0.67	2.02	131
Jan. 14	do	120	189	0.51	2.08	96
Feb. 23	do	75	124	0.62	2.25	77
Mar. 21	do	90	186	0.81	2.88	150
April 6	do	235	576	1.90	3.94	1,093
April 24	do	283	533	1.46	1.89	781
May 17	C. H. McGavin	257	503	1.57	2.05	793
June 10	do	307	835	2.33	3.46	1,950
July 1	do	333	1,150	2.89	4.39	3,318
July 1	do	333	1,150	2.89	4.39	3,323 ^x
July 5	do	367	2,237	4.62	7.57	10,346 ^x
July 21	do	296	790	2.29	2.92	1,811
Aug. 11	do	298	792	2.42	3.26	1,914
Sept. 4	W. T. Reeve	304	785	2.09	2.96	1,638
Sept. 25	do	283	482	1.53	1.83	735
Oct. 23	do	298	709	2.00	2.79	1,421
Nov. 21	do	279	536	0.95	2.33	510
Dec. 12	do	170	356	0.76	1.86	271

^x Slope measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of McLeod river near Thornton, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	2.00 ^b	158	2.14	72	2.30	62	3.00	857	2.76	1,405	4.79	3,979
2....	2.00	152	2.14	77	2.30	60	3.10	884	3.76	2,463	4.09	2,896
3....	2.00	147	2.14	78	2.40	60	3.50	918	4.45	3,423	4.09	2,896
4....	2.00	140	2.14	80	2.40	60	3.60	957	4.15	2,980	4.69	3,808
5....	2.00	131	2.13	79	2.40	60	3.90	1,076	4.15	2,980	4.59	3,644
6....	1.99	123	2.23	78	2.40	66	3.90	1,093	3.54	2,206	4.09	2,896
7....	1.99	117	2.13	76	2.50	71	3.90	1,076	3.54	1,986	3.69	2,378
8....	1.99	109	2.13	70	2.50	80	4.39	1,216	3.03	1,667	3.49	2,149
9....	1.99	100	2.13	70	2.50	88	4.39	1,216	2.83	1,470	3.49	2,149
10....	1.99	95	2.12	70	2.50	93	4.49	1,264	2.52	1,191	3.59	2,263
11....	1.98	92	2.12	69	2.60	104	4.29	1,170	2.32	1,033	3.59	2,263
12....	2.08	92	2.12	69	2.60	113	3.09	1,260	2.11	885	3.59	2,263
13....	2.08	93	2.12	70	2.60	120	3.09	1,260	2.11	885	3.59	2,263
14....	2.08	96	2.22	70	2.60	120	2.89	1,167	2.00	812	3.89	2,627
15....	2.08	93	2.21	70	2.60	120	2.69	1,073	2.00	812	3.99	2,759
16....	2.07	90	2.21	71	2.60	121	2.59	1,027	2.10	878	4.29	3,181
17....	2.07	85	2.21	72	2.60	123	2.79	1,120	2.09	871	4.19	3,036
18....	2.07	83	2.21	74	2.60	132	2.59	1,027	2.09	871	4.19	3,036
19....	2.07	80	2.21	76	2.60	138	2.49	950	2.09	871	4.19	3,036
20....	2.07	80	2.21	77	2.70	143	2.09	785	2.19	939	4.59	3,644
21....	2.06	76	2.21	78	2.80	150	1.99	745	2.39	1,086	6.79	8,404
22....	2.06	73	2.21	79	2.80	190	1.99	745	2.49	1,166	5.69	5,728
23....	2.06	72	2.20	77	2.80	270	1.99 ^b	745	2.29	1,011	4.69	3,808
24....	2.06	70	2.20	77	2.80	328	1.89	742	2.29	1,011	4.19	3,036
25....	2.06	69	2.20	73	2.80	365	1.89	742	2.39	1,086	3.99	2,759
26....	2.15	68	2.20	70	2.90	420	1.88	736	2.49	1,166	3.99	2,759
27....	2.15	67	2.20	70	2.90	485	2.28	1,004	2.59	1,251	3.99	2,759
28....	2.15	64	2.20	68	2.90	550	2.67	1,323	2.79	1,433	4.19	3,036
29....	2.15	65	2.20	65	2.90	610	2.77	1,414	2.99	1,626	3.99	2,759
30....	2.15	67	.....	.....	3.00	695	2.76	1,405	3.09	1,728	3.89	2,627
31....	2.14	70	.....	.....	3.00	790	.....	.....	3.49	2,149	.....	.....

^b Ice conditions January 1 to April 23.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of McLeod river near Thornton, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	4.40	3,346	3.83	2,550	2.29	1,011	1.86	724	2.20	946	1.94	420
2....	4.19	3,036	3.54	2,206	2.59	1,251	1.86	724	2.10	878	1.94	420
3....	3.89	2,627	3.44	2,094	2.69	1,341	1.87	730	2.10	878	1.94	395
4....	4.88	4,135	3.44	2,094	3.10	1,738	1.87	730	2.00	812	1.93	360
5....	7.57	10,432	3.85	2,576	3.10	1,738	1.77	671	1.80	688	1.83	330
6....	6.47	7,585	3.55	2,217	3.00	1,636	1.77	671	1.71	638	1.82	310
7....	5.96	6,336	3.35	1,997	2.80	1,442	1.87	730	1.51	531	1.82	300
8....	5.56	5,451	3.16	1,799	2.70	1,350	2.07	858	1.41	481	1.82	290
9....	5.16	4,654	3.06	1,697	2.59	1,251	2.07	858	1.71	638	1.81	270
10....	4.95	4,260	3.36	2,008	2.69	1,341	1.98	799	1.01	299	1.81	270
11....	4.65	3,742	3.27	1,913	2.59	1,251	1.98	799	1.12b	340	1.81	270
12....	4.24	3,108	2.97	1,606	2.49	1,166	1.98	799	1.32	400	1.90	270
13....	4.04	2,827	2.87	1,508	2.39	1,086	1.98	799	1.62	550	1.90	270
14....	3.93	2,680	2.67	1,323	2.28	1,004	1.98	799	1.82	560	1.91	270
15....	3.63	2,309	2.57	1,234	2.18	932	1.98	799	1.82	560	2.01	270
16....	3.43	2,083	2.57	1,234	2.08	865	2.09	871	2.13	555	2.02	265
17....	3.32	1,965	2.87	1,508	2.08	865	2.29	1,011	2.33	550	2.02	265
18....	3.32	1,965	3.07	1,707	1.98	799	2.69	1,341	2.33	535	2.03	260
19....	3.31	1,955	3.08	1,718	1.87	730	2.69	1,341	2.13	520	2.03	250
20....	3.11	1,748	3.08	1,718	1.87	730	2.59	1,251	2.23	520	2.04	230
21....	2.90	1,536	2.98	1,616	1.77	671	2.59	1,251	2.38	510	2.04	205
22....	2.80	1,442	2.88	1,517	1.77	671	2.69	1,341	2.38	465	2.05	185
23....	2.80	1,442	2.78	1,424	1.77	671	2.80	1,442	2.38	405	2.05	170
24....	2.61	1,269	2.68	1,332	1.77	671	2.70	1,350	2.27	400	2.06	165
25....	2.61	1,269	2.58	1,243	1.76	666	2.70	1,350	2.17	405	2.06	165
26....	2.71	1,359	2.38	1,079	1.76	666	2.70	1,350	1.96	410	2.07	175
27....	5.22	4,768	2.39	1,086	1.96	786	2.80	1,442	1.96	415	2.07	195
28....	5.72	5,794	2.29	1,011	1.96	786	2.60	1,260	1.96	415	2.08	215
29....	5.12	4,578	2.19	939	1.86	724	2.50	1,174	1.95	420	2.08	225
30....	4.63	3,709	2.19	939	1.86	724	2.30	1,018	1.95	420	2.09	230
31....	4.23	3,094	2.19	939	.....	.....	2.20	946	.....	.....	2.09b	235

b Ice conditions November 11 to December 31.

MONTHLY DISCHARGE of McLeod river near Thornton, for 1916

(Drainage area 2,521 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	158	64	94	0.037	0.04	5,780
February.....	80	65	73	0.029	0.03	4,199
March.....	790	60	219	0.087	0.10	13,466
April.....	1,414	736	1,033	0.410	0.46	61,468
May.....	3,423	812	1,463	0.580	0.67	89,956
June.....	8,404	2,149	3,161	1.254	1.40	188,093
July.....	10,432	1,269	3,436	1.363	1.57	211,271
August.....	2,576	939	1,607	0.637	0.73	98,811
September.....	1,738	666	1,019	0.404	0.45	60,635
October.....	1,442	671	1,007	0.400	0.46	61,918
November.....	946	299	538	0.213	0.24	32,013
December.....	420	165	263	0.104	0.12	16,171
The year.....	.....	.....	.....	.....	6.27	843,781

PEMBINA RIVER AT ENTWISTLE

Location.—On the SW. $\frac{1}{4}$ Sec. 20, Tp. 53, Rge. 7, W. 5th Mer., directly under the Grand Trunk Pacific railway trestle about one and one-half miles west of the Entwistle station.

Records available.—Gauge heights available from May 8, 1914, to December 31, 1916. Discharge measurements available from December 19, 1913, to December 31, 1916.

Gauge.—Vertical staff, spiked to pile about twenty feet down stream from the cable and twenty feet from the right bank; datum maintained at 2,348.06 feet.

Bench-mark.—Permanent iron bench-mark on the right bank and twenty feet west of cable tower; elevation 2,364.60 feet (Grand Trunk Pacific railway datum).

Channel.—One channel at all stages, fairly permanent.

Discharge measurements.—Made from a cable car.

Winter flow.—River affected by ice from November to April; discharge measurements made at a point about 800 feet below regular station during the winter.

Observer.—A. Doucette.

Accuracy.—The gauge rod at this station is read to tenths of a foot and is observed at the same hour daily, and the results are fairly accurate.

The curve is smooth and regular and is plotted from ten open water measurements; it passes through six of the points and the remainder are close to it. The results are well within the error limit.

Winter records are based upon daily gauge heights, temperature records and frequent measurements, from which a graph is derived which is a fairly accurate estimate.

DISCHARGE MEASUREMENTS of Pembina river at Entwistle, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 8.....	R. J. McGuinness.....	80	145.0	0.32	1.93	47
Jan. 13.....	do.....	80	168.0	0.28	1.91	47
Feb. 9.....	do.....	75	114.0	0.33	1.90	38
Feb. 26.....	do.....	80	90.0	0.55	1.81	50
Feb. 28.....	do.....	80	97.5	0.57	1.91	56
March 20.....	do.....	80	95.0	0.54	2.40	51
April 8.....	do.....	150	240.0	1.47	3.42	333
April 26.....	do.....	153	606.0	0.76	1.58	459
May 20.....	C. H. McGavin.....	152	501.0	0.81	1.38	407
June 13.....	do.....	162	698.0	1.84	2.58	1,283
July 3.....	do.....	166	754.0	2.20	2.91	1,659
July 3.....	do.....	166	754.0	2.20	2.91	1,659 ^x
July 5.....	do.....	179	1,444.0	4.16	6.68	6,000 ^x
July 25.....	do.....	156	694.7	1.49	2.42	1,036
Aug. 15.....	do.....	153	577.0	1.17	1.86	677
Sept. 5.....	W. T. Reeve.....	157	719.0	1.76	2.49	1,270
Sept. 6.....	do.....	164	810.0	2.10	2.96	1,701
Sept. 28.....	do.....	151	539.0	0.97	1.38	523
Oct. 27.....	do.....	156	610.0	1.25	2.06	759
Nov. 22.....	do.....	145	412.0	0.80	1.56	329
Dec. 13.....	do.....	119	224.0	0.34	1.77	77
Dec. 30.....	do.....	119	235.0	0.41	1.82	95

^x Slope measurement.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Pembina river at Entwistle, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	1.70b	59	1.81	40	1.91	54	3.01	280	2.14	889	2.90	1,635
2....	1.70	58	1.81	40	1.91	53	3.01	280	2.54	1,260	3.30	2,066
3....	1.80	56	1.81	39	2.01	52	2.91	300	3.20	1,957	2.60	1,320
4....	1.80	53	1.81	39	2.21	52	2.91	320	3.34	2,110	2.90	1,635
5....	1.90	52	1.81	39	2.21	51	2.91	340	3.14	1,892	2.90	1,635
6....	1.80	50	1.81	38	2.21	50	3.71	345	2.94	1,677	2.70	1,425
7....	1.80	48	1.91	38	2.21	49	3.72	349	2.74	1,367	2.40	1,125
8....	1.91	47	1.91	38	2.21	49	3.42	353	2.44	1,163	1.90	700
9....	1.91	47	1.91	38	2.21	49	3.77	431	2.24	976	2.00	775
10....	1.91	47	1.91	38	2.21	49	3.72	420	2.14	889	2.00	775
11....	2.01	47	2.01	38	2.21	50	3.35	488	1.94	730	2.10	855
12....	1.91	47	2.01	39	2.21	50	3.25	454	1.94	730	2.59	1,310
13....	1.91	47	2.01	39	2.11	50	3.05	386	2.24	976	2.80	1,530
14....	1.91	47	2.11	40	2.11	50	3.25	454	1.84	658	2.50	1,220
15....	1.91	47	2.11	41	2.11	50	3.15	420	1.74	596	2.50	1,220
16....	1.91	46	2.21	43	2.21	50	2.65	456	1.64	544	2.40	1,125
17....	1.91	46	2.21	45	2.21	51	2.75	470	1.54	496	2.20	940
18....	1.91	46	2.21	46	2.31	51	2.75	470	2.34	1,068	2.00	775
19....	1.91	46	2.21	47	2.31	51	2.85	484	2.34	1,068	1.90	700
20....	1.91	46	2.21	47	2.41	51	2.25	507	1.90	700	1.90	700
21....	1.91	46	2.21	48	2.61	54	1.75	500	1.90	700	2.00	775
22....	1.91	46	2.11	48	2.61	60	1.65	483	1.80	630	2.00	775
23....	1.91	46	2.11	48	2.71	66	1.45	457	1.80	630	2.60	1,320
24....	1.91	46	2.01	49	2.71	71	1.45	457	1.90	700	2.41	1,135
25....	1.91	46	1.81	49	2.71	74	1.55b	458	1.90	700	2.11	864
26....	1.91	45	1.81	50	2.81	80	1.58	515	2.00	775	2.01	783
27....	1.91	44	1.81	52	2.81	85	1.55	501	2.70	1,325	1.91	708
28....	1.91	43	1.81	56	2.91	92	1.65	549	2.30	1,030	1.91	708
29....	1.91	42	1.81	56	2.91	100	1.75	602	2.30	1,030	1.91	708
30....	1.91	42	.....	.....	3.01	170	1.95	738	2.20	940	2.11	864
31....	1.91	42	.....	.....	3.01	238	.....	.....	2.30	1,030	.....	.....

b Ice conditions, January 1 to April 25.

DAILY GAUGE HEIGHT AND DISCHARGE OF Pembina river at Entwistle, for 1916—*Concluded*

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	2.11	864	2.89	1,624	1.70	574	1.51	483	1.89	693	1.88	248
2....	2.61	1,330	2.39	1,115	1.84	658	1.51	483	1.85	665	1.80	248
3....	3.92	2,747	2.34	1,068	1.98	760	1.56	506	1.70	574	1.82	235
4....	6.61	5,916	2.39	1,115	2.33	1,058	1.51	483	1.65	549	1.94	225
5....	5.01	4,012	2.40	1,125	2.62	1,341	1.52	487	1.71b	530	1.96	230
6....	5.00	4,000	2.45	1,172	2.87	1,604	1.52	487	1.66	504	1.68	225
7....	4.79	3,754	2.75	1,478	2.87	1,604	1.42	444	1.71	475	1.60	205
8....	4.13	2,990	2.45	1,172	2.82	1,551	1.43	448	1.77	460	1.57	180
9....	4.97	3,965	2.25	985	2.66	1,383	1.53	492	1.62	420	1.59	160
10....	4.36	3,254	2.11	864	2.61	1,330	1.68	564	1.62	385	1.61	100
11....	3.35	2,120	2.01	783	2.46	1,182	1.63	539	1.52	368	1.58	70
12....	3.74	2,549	2.11	864	2.40	1,125	1.59	519	1.63	373	1.80	70
13....	3.93	2,760	2.06	823	2.15	898	1.64	544	1.68	378	1.82	77
14....	3.83	2,648	1.91	708	2.05	815	1.59	519	1.63	376	1.82	100
15....	3.52	2,307	1.87	679	1.84	658	1.55	501	1.64	368	1.72	112
16....	3.41	2,186	1.86	672	1.74	596	1.45	456	1.54	355	1.62	115
17....	3.00	1,741	1.85	665	1.79	624	1.55	501	1.49	334	1.52	115
18....	3.06	1,805	1.90	700	1.78	619	1.70	574	1.40	332	1.52	115
19....	2.96	1,699	2.34	1,068	1.68	564	1.76	608	1.55	334	1.72	112
20....	2.96	1,699	2.73	1,456	1.63	539	1.71	580	1.45	320	1.72	102
21....	2.87	1,604	2.77	1,498	1.52	487	1.86	672	1.40	326	1.42	70
22....	2.97	1,709	2.52	1,240	1.57	510	1.97	752	1.56	329	1.53	70
23....	2.67	1,394	2.26	994	1.52	487	1.87	679	1.56	285	1.53	76
24....	2.37	1,096	2.05	815	1.56	506	1.97	752	1.56	225	1.53	80
25....	2.18	923	1.90	700	1.41	439	2.47	1,192	1.58	227	1.43	89
26....	2.08	839	1.84	658	1.51	483	2.08	839	1.08	232	1.63	72
27....	2.28	1,012	1.83	651	1.56	506	2.08	839	1.55	235	1.63	70
28....	3.65	2,450	1.73	591	1.40	435	2.13	880	1.52	235	1.53	70
29....	3.60	2,395	1.67	559	1.50	478	2.09	847	1.79	232	1.54	70
30....	3.20	1,957	1.66	554	1.55	501	2.49	1,210	1.81	236	1.52	95
31....	3.09	1,837	1.71	580	.....	.....	1.99	768	.....	.....	1.83b	95

b Ice conditions, November 5 to December 31.

MONTHLY DISCHARGE OF Pembina river at Entwistle, for 1916

(Drainage area 1,753 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	59	42	47	0.025	0.03	2,890
February.....	56	38	44	0.024	0.03	2,531
March.....	238	49	68	0.039	0.04	4,181
April.....	738	280	442	0.252	0.28	26,301
May.....	2,110	496	1,008	0.575	0.66	61,979
June.....	2,066	700	1,070	0.610	0.68	63,670
July.....	5,916	839	2,308	1.317	1.52	141,913
August.....	1,624	554	935	0.533	0.61	57,491
September.....	1,604	435	810	0.462	0.52	48,198
October.....	1,210	444	634	0.362	0.42	38,983
November.....	693	225	378	0.216	0.24	22,493
December.....	248	70	126	0.072	0.08	7,747
The year.....					5.11	478,377

SESSIONAL PAPER No. 25B

LOBSTICK RIVER NEAR ENTWISTLE

Location.—On the NE. $\frac{1}{4}$ Sec. 30, Tp. 53, Rge. 7, W. 5th Mer., about two and one-half miles northwest of the village of Entwistle.

Records available.—Gauge heights available from July 11, 1913, to December 31, 1915. Discharge measurements available from February 20, 1913, to December 31, 1916.

Gauge.—Vertical staff at right bank and spiked to downstream side of bridge abutment; elevation of zero maintained at 2,366.19, since establishment.

Bench-mark.—Permanent iron bench-mark on right bank of river and about sixty feet west of the gauge; elevation 2,375.14 feet (Grand Trunk Pacific railway datum).

Channel.—Fairly permanent.

Discharge measurements.—Made from a bridge, or by wading.

Winter flow.—River affected by ice from November to April.

Observer.—A Doucette.

DISCHARGE MEASUREMENTS of Lobstick river near Entwistle, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 8.....	R. J. McGuinness.....	31	36.35	0.33	1.54	12.00
Jan. 13.....	do.....	31	20.05	0.31	1.44	6.20
Feb. 10.....	do.....	20	6.00	0.10	1.34	0.60
Feb. 26.....	do.....	30	4.00	0.05	1.30	0.20
Mar. 1.....	do.....	30	4.00	0.05	1.30	0.20
Mar. 20.....	do.....	30	9.50	0.10	1.49	0.97
April 8.....	do.....	50	40.75	2.37	2.88	97.00
April 26.....	do.....	68	71.90	2.08	1.81	149.00
May 21.....	C. McGavin.....	75	77.00	1.75	1.62	135.00
June 14.....	do.....	74	64.60	1.55	1.66	101.00
July 4.....	do.....	86	223.00	4.42	3.50	987.00 [±]
July 25.....	do.....	81	120.50	2.65	2.25	320.00
July 25.....	do.....	81	120.50	2.65	2.25	320.00 [±]
Aug. 15.....	do.....	76	84.30	2.19	1.82	185.00
Sept. 5.....	W. T. Reeve.....	76	114.00	2.76	2.16	314.00
Sept. 6.....	do.....	77	114.00	2.60	2.13	296.00
Sept. 28.....	do.....	75	82.75	1.85	1.79	153.00
Oct. 27.....	do.....	74	78.75	1.77	1.76	140.00
Nov. 23.....	do.....	57	110.00	0.91	3.02	100.00
Dec. 14.....	do.....	65	60.00	1.04	4.05	62.00

[±] Slope measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Lobstick river near Entwistle, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	1.10 ^b	25	1.40	12	1.10	1	1.60	23	2.01	238	1.77	158
2....	1.10	23	1.40	11	1.10	1	1.60	24	2.21	329	1.97	223
3....	1.10	20	1.40	10	1.10	2	1.50	27	3.41	941	1.77	158
4....	1.10	17	1.40	7	1.10	2	1.50	35	3.21	837	1.47	96
5....	1.10	16	1.40	5	1.10	2	1.80	57	2.82	634	1.47	96
6....	1.10	13	1.40	3	1.10	2	2.20	76	2.12	287	1.37	81
7....	1.10	12	1.40	2	1.10	3	2.80	97	1.72	145	1.37	81
8....	1.10	12	1.40	2	1.10	4	2.88	97	1.62	122	1.27	69
9....	1.20	10	1.40	1	1.10	5	2.89 ^a	100	1.53	105	1.28	70
10....	1.30	9	1.40	1	1.10	5	2.90	100	1.53	105	1.28	70
11....	1.30	8	1.40	2	1.10	4	2.90	105	1.43	90	1.38	82
12....	1.30	7	1.40	3	1.10	3	3.00	120	1.53	105	1.66	131
13....	1.30	6	1.40	4	1.10	3	3.20	150	1.64	127	1.48	97
14....	1.40	8	1.50	5	1.10	2	4.20	295	1.74	150	1.38	82
15....	1.40	12	1.50	5	1.30	1	4.20	295	1.64	127	1.38	82
16....	1.40	14	1.50	6	1.30	1	2.10	226	1.64	127	1.28	70
17....	1.40	14	1.60	6	1.30	1	2.20	250	1.55	109	1.28	70
18....	1.40	14	1.60	7	1.30	1	2.20	253	1.55	109	1.28	70
19....	1.30	12	1.60	6	1.30	1	2.30	256	1.45	92	1.18	60
20....	1.30	9	1.70	6	1.30	1	1.90	240	1.45	92	1.18	60
21....	1.20	7	1.60	5	1.30	2	1.60	190	1.46	94	1.28	70
22....	1.20	6	1.60	4	1.30	4	1.50	118	1.36	80	1.28	70
23....	1.10	6	1.60	3	1.40	5	1.30 ^b	119	1.36	80	1.38	82
24....	1.40	7	1.50	2	1.40	6	1.20	62	1.36	80	1.37	81
25....	1.50	7	1.40	2	1.40	8	1.20	62	1.56	111	1.17	59
26....	1.50	8	1.30	1	1.50	10	1.20	62	1.76	155	1.17	59
27....	1.60	9	1.30	1	1.50	12	1.30	72	1.96	219	1.17	59
28....	1.70	10	1.30	1	1.60	13	1.50	100	1.66	131	1.17	59
29....	1.70	11	1.30	1	1.60	15	1.50	100	1.47	96	1.17	59
30....	1.60	12	.....	.....	1.70	20	1.80	165	1.47	96	1.17	59
31....	1.50	12	.....	.....	1.70	23	.....	.....	1.47	96	.....	.....

^a Gauge height interpolated.^b Ice conditions January 1 to April 23.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Lobstick river near Entwistle, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	1.17	59	1.95	215	1.60	118	1.82	171	1.75	152	3.93	86
2....	1.27	69	1.70	140	1.75	152	1.77	158	1.80	165	3.93	85
3....	1.67	133	1.60	118	1.90	196	1.77	158	1.75	152	3.92	83
4....	3.50	988	1.79	162	2.00	234	1.72	145	1.70	140	3.97	80
5....	3.56	1,019	1.89	193	2.11	283	1.67	133	1.65	129	3.97	76
6....	3.66	1,071	1.99	230	2.21	329	1.62	122	1.60	118	3.87	70
7....	3.66	1,071	2.09	274	2.11	283	1.52	104	1.70	140	3.77	64
8....	3.77	1,128	1.93	207	2.16	306	1.62	122	1.75	152	3.87	59
9....	3.57	1,024	1.88	190	2.11	283	1.62	122	1.70	140	3.87	55
10....	3.62	1,050	1.83	174	2.01	238	1.72	145	1.65	129	3.97	53
11....	3.17	816	1.78	160	1.91	200	1.82	171	1.60	118	4.37	54
12....	3.18	822	1.77	158	1.81	168	1.72	145	1.64 ^b	117	4.07	56
13....	3.28	874	1.67	133	1.71	142	1.62	122	1.79	119	4.07	60
14....	3.18	822	1.62	122	1.66	131	1.67	133	1.99	122	4.06	62
15....	2.88	666	1.61	120	1.61	120	1.82	171	2.29	123	3.81	64
16....	2.48	458	1.50	100	1.61	120	1.72	145	2.39	123	3.81	64
17....	2.39	415	1.60	118	1.61	120	1.77	158	2.59	120	3.81	63
18....	2.39	415	1.65	129	1.61	120	1.82	171	2.79	117	3.81	61
19....	2.29	367	1.70	140	1.66	131	1.78	160	2.79	113	2.86	58
20....	2.29	367	1.65	129	1.71	142	1.73	148	2.89	109	2.76	56
21....	2.20	324	1.75	152	1.66	131	1.68	136	2.79	105	2.56	54
22....	2.30	372	1.70	140	1.71	142	1.73	148	2.73	103	2.36	54
23....	2.35	396	1.60	118	1.81	168	1.78	160	3.02	100	2.36	53
24....	2.30	372	1.50	100	1.86	184	1.78	160	3.13	98	2.36	54
25....	2.21	329	1.45	92	1.91	200	1.83	174	3.09	95	2.16	54
26....	2.21	329	1.40	85	2.11	283	1.93	207	3.10	93	2.06	54
27....	2.31	377	1.45	92	1.91	200	1.93	207	3.68	92	2.07	54
28....	2.30	372	1.40	85	1.77	158	1.75	152	3.78	90	2.07	55
29....	2.56	499	1.40	85	1.82	171	1.80	165	3.83	89	2.07	56
30....	2.20	324	1.45	92	1.87	187	1.90	196	3.93	87	2.07	58
31....	2.10	278	1.50	100	.....	.....	1.80	165	.....	.....	2.10 ^b	60

^b Ice conditions November 12 to December 31.

MONTHLY DISCHARGE of Lobstick river near Entwistle, for 1916

(Drainage area 698 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	25	6	11	0.016	0.02	676
February.....	12	1	4	0.006	0.01	230
March.....	23	1	5	0.007	0.01	307
April.....	295	23	129	0.185	0.21	7,676
May.....	941	80	197	0.282	0.33	12,113
June.....	223	59	85	0.122	0.14	5,058
July.....	1,071	59	568	0.814	0.94	34,925
August.....	274	85	140	0.200	0.23	8,608
September.....	329	118	188	0.270	0.30	11,187
October.....	207	104	154	0.221	0.25	9,469
November.....	165	87	118	0.169	0.19	7,021
December.....	86	53	62	0.089	0.10	3,812
The year.....	.....	.....	.....	.....	2.73	101,082

SWAN RIVER NEAR KINUSO

Location.—On the NE. $\frac{1}{4}$ Sec. 23, Tp. 73, Rge. 10, W. 5th Mer. on the Edmonton, Dunvegan and British Columbia railway bridge, one-half mile east of Kinuso.

Records available.—May 19 to October 31, 1915, and April 14, 1916, to November 4, 1916.

Gauge.—Vertical staff; elevation of zero 85.58 feet.

Bench-marks.—(1) Marked on pier; assumed elevation 100.00 feet. (2) Spike driven in 8-inch cottonwood tree, 50 feet from left bank of river and 130 feet up stream from the bridge; assumed elevation 107.08 feet.

Channel.—Two channels at all times.

Discharge measurements.—Made from bridge.

Winter flow.—No winter measurements taken.

Observer.—J. Guisseppe.

DISCHARGE MEASUREMENTS of Swan river near Kinuso, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 14.....	C. M. O'Neil.....	146	862	0.40	5.83	367 ^e
May 12.....	H. S. Kerby.....	125	586	1.59	4.99	929
June 6.....	P. H. Daniels.....	126	492	1.63	4.58	810
June 24.....	do.....	113	336	0.71	2.77	239
July 12.....	do.....	129	645	1.37	4.81	881
July 14.....	do.....	134	984	2.04	7.46	2,003
July 26.....	do.....	120	410	0.96	3.58	393
Oct. 14.....	C. McGavin.....	105	214	0.62	2.45	132
Nov. 4.....	do.....	116	371	0.24	3.82	89

^e Discharge estimated from cross-section and velocity; ice was running.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Swan river near Kinuso, for 1916

Day	April		May		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			4.95	942	4.62	805	2.74	182
2.....			4.60	797	4.74	854	2.92	219
3.....			6.20	1,467	4.52	765	3.27	311
4.....			6.90	1,765	4.14	614	4.82	887
5.....			7.38	1,971	4.47	745	8.82	2,591
6.....			7.15	1,872	4.48	749	8.62	2,505
7.....			7.00	1,808	4.18	629	9.77	2,999
8.....			6.45	1,572	4.01	564	8.02	2,247
9.....			6.18	1,459	3.78	480	7.22	1,903
10.....			6.35	1,530	4.83	498	6.67	1,666
11.....			5.20	1,047	6.18	1,450	5.97	1,370
12.....			4.78	871	7.93	2,208	5.12	1,013
13.....			4.48	749	7.88	2,186	6.17	1,454
14.....	4.78 ^b	450	4.48	749	7.33	1,950	7.07	1,838
15.....	5.05	480	4.30	677	6.58	1,627	6.62	1,645
16.....	4.70	520	4.25	657	6.23	1,480	6.17	1,454
17.....	4.15 ^b	560	4.30	677	5.83	1,312	5.52	1,181
18.....	4.05	579	4.22	645	5.25	1,068	6.52	1,602
19.....	4.22	645	4.25	657	5.08	997	6.07	1,412
20.....	4.30	677	4.42	725	5.43	1,144	5.60	1,215
21.....	4.05	579	4.76	863	4.63	809	4.82	887
22.....	4.05	579	5.31	1,093	3.93	534	4.37	705
23.....	4.00	560	5.61	1,219	3.58	410	4.57	785
24.....	4.18	629	5.16	1,030	2.72	178	4.32	685
25.....	4.18	629	4.66	822	2.57	151	3.92	530
26.....	4.40	717	4.36	701	2.47	136	3.62	424
27.....	4.62	805	4.06	583	2.17	99	3.37	342
28.....	5.20	1,047	3.99	556	2.40	126	3.67	442
29.....	5.95	1,362	3.77	476	2.47	135	4.27	665
30.....	5.35	1,110	4.20	637	2.57	151	3.82	494
31.....			4.57	785			3.67	442

^b Ice conditions, April 14-17.

DAILY GAUGE HEIGHT AND DISCHARGE of Swan river near Kinuso, for 1916—*Concluded*

Day	August		September		October		November	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	3.42	357	1.87	72	1.69	58	4.12	94
2	3.07	256	1.82	68	1.73	61	3.95	92
3	2.80	193	1.82	68	1.83	68	3.90	90
4	3.62	424	1.90	74	1.93	76	3.90 <i>d</i>	89
5	3.17	282	2.06	88	2.31	114		
6	2.67	169	2.16	98	2.43	130		
7	2.50	140	2.21	103	2.51	142		
8	2.54	146	2.06	88	2.41	127		
9	2.57	151	2.01	83	2.49	139		
10	2.64	163	2.01	83	2.51	142		
11	2.82	197	2.01	83	2.51	142		
12	3.07	256	2.01	83	2.56	150		
13	2.77	187	1.96	79	2.51	142		
14	2.60	156	1.91	75	2.42	129		
15	2.40	126	1.91	75	2.40	126		
16	2.30	113	2.01	83	2.30	113		
17	2.22	104	1.99	81	2.35 ^b	112		
18	2.14	96	1.96	79	2.55	111		
19	2.12	94	1.89	73	2.62	110		
20	2.02	84	1.81	67	2.72	109		
21	2.07	89	1.66	57	3.08	108		
22	2.32	116	1.59	54	3.22	107		
23	2.22	104	1.53	51	3.30	105		
24	1.97	80	1.51	50	3.45	104		
25	1.97	80	1.53	51	3.58	103		
26	1.94	77	1.56	52	3.68	102		
27	2.02	84	1.59	54	3.70	101		
28	2.02	84	1.53	51	3.72	98		
29	2.02	84	1.51	50	3.85	96		
30	1.94	77	1.59	54	3.92	96		
31	1.92	76			4.05	95		

^b Ice conditions, October 17 to November 4.^d Actual measurement.

MONTHLY DISCHARGE of Swan river near Kinuso, for 1916

(Drainage area 873 square miles)

MONTH	DISCHARGE IN SECOND-FOOT				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April (14-30)	1,362	450	702	0.803	0.44	23,665
May	1,971	476	1,013	1.160	1.34	62,287
June	2,208	99	829	0.950	1.06	49,329
July	2,999	182	1,164	1.333	1.54	71,572
August	424	76	150	0.172	0.20	9,223
September	103	50	71	0.081	0.09	4,225
October	150	58	110	0.126	0.15	6,764
November (1-4)	94	89	91	0.104	0.01	722
The period					4.83	227,787

SESSIONAL PAPER No. 25B

LESSER SLAVE LAKE AT GROUARD

Location.—On the SW. $\frac{1}{4}$ Sec. 19, Tp. 75, Rge. 14, W. 5th Mer., at Grouard, in the province of Alberta.

Established.—September 23, 1914, by F. R. Burfield.

Records available.—Gauge heights taken at regular intervals of several days from September 23, 1914, to December 31, 1916.

Gauge.—Vertical staff; elevation of zero maintained at 84.23 feet.

Bench-mark.—Spike at base of telegraph pole 15 feet southeast of easterly end of bridge; assumed elevation 96.33 feet.

Observer.—Chas. Nash.

DAILY GAUGE HEIGHT, IN FEET, of Lesser Slave lake at Grouard, for 1916

Day	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
1.	5.44		4.88	4.85			5.65	6.41				
2.		5.03			6.08	6.10			6.27		5.32	4.82
3.										5.22		
4.			4.93								5.27	
5.	5.44	4.98		4.85			5.75	6.22				
6.					6.05				5.47			4.83
7.						6.11				5.16		
8.	5.44		4.87	5.25			6.41				4.92	4.84
9.		4.97						6.30	5.22			
10.				5.98	6.09	6.00						
11.			4.86							5.01		
12.	5.44	4.96		6.05			6.46	6.22			4.87	
13.					6.15				5.27			
14.			4.90			5.95				5.07		
15.				6.38			6.56				4.83	
16.		4.90						5.97	5.57			
17.					6.11	6.00						
18.			4.85							5.22	4.89	
19.		4.94		6.57			6.46	6.02				
20.					6.13				5.52			
21.						6.30				4.97		
22.	5.05		4.85	6.58			6.51	5.82			4.95	
23.		4.94							5.37			
24.			4.85		6.12	6.00				5.02	4.96	
25.												
26.	5.05	4.88		5.75			6.46	5.77				
27.									5.33			
28.					6.12	6.12				5.12		
29.	5.04		4.85	5.67			6.46	5.82			4.97	
30.									5.27			
31.					6.13							

Water frozen to bottom at gauge, January 15-22 and December 16-31.

LESSER SLAVE LAKE NEAR SAWRIDGE

Location.—On the SW. $\frac{1}{4}$ Sec. 15, Tp. 73, Rge. 6, W. 5th Mer., on a bay in Dog Island, three miles northwest of Sawridge.

Records available.—Gauge heights May 21, 1915, to December 31, 1916.

Gauge.—Vertical staff; on pile of Herman Niclas' landing pier on Dog Island; zero elevation maintained at 94.10 feet from May 21, 1915, to November 22, 1915; zero elevation maintained at 91.70 feet from November 23, 1915, to December 31, 1916.

All records have been reduced to this latter datum.

Bench-mark.—Six-inch spike in poplar tree, twenty feet from edge of lake, and eighty feet north of the gauge; assumed elevation 100.00 feet.

Observer.—Herman Niclas.

DAILY GAUGE HEIGHT, IN FEET, of Lesser Slave lake near Sawridge, for 1916

Day	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
1.....	2.60	2.80	2.44	2.35	2.65	3.37	3.46	3.84	3.11	2.84	2.74	2.28
2.....	2.69	2.69	2.54	2.34	2.64	3.47	3.46	4.04	3.21	2.79	2.64	2.18
3.....	2.68	2.69	2.53	2.34	2.64	3.47	3.46	3.94	3.21	2.84	2.54	2.08
4.....	2.77	2.69	2.53	2.34	2.64	3.47	3.86	3.84	3.41	2.83	2.69	2.18
5.....	2.66	2.59	2.43	2.33	2.63	3.47	3.66	3.88	3.36	2.88	2.80	1.98
6.....	2.75	2.59	2.53	2.33	2.63	3.57	3.66	3.93	3.36	2.83	2.75	1.88
7.....	2.75	2.59	2.42	2.33	2.63	3.58	3.66	3.83	3.11	2.73	2.80	1.88
8.....	2.74	2.59	2.52	2.32	2.83	3.58	3.71	3.98	3.21	2.83	2.61	1.88
9.....	2.73	2.59	2.52	2.32	2.73	3.68	3.76	4.18	3.51	2.78	2.76	1.88
10.....	2.62	2.59	2.52	2.22	2.78	3.78	3.96	4.23	3.35	2.78	2.96	1.88
11.....	2.71	2.58	2.52	2.31	2.83	3.68	3.86	3.78	3.45	2.83	2.62	1.88
12.....	2.70	2.58	2.41	2.31	2.84	3.68	3.86	3.63	3.35	2.73	2.52	2.08
13.....	2.70	2.68	2.51	2.21	2.84	3.68	4.15	3.78	3.20	2.83	2.52	2.18
14.....	2.69	2.68	2.51	2.20	2.94	3.68	3.95	3.83	3.15	2.78	2.63	2.18
15.....	2.68	2.67	2.51	2.30	2.94	3.68	3.90	3.68	3.20	3.08	2.53	2.18
16.....	2.67	2.67	2.50	2.30	2.94	3.58	3.85	3.73	3.15	2.62	2.63	2.18
17.....	2.66	2.67	2.50	2.29	2.94	3.58	3.85	3.62	3.10	2.77	2.54	2.18
18.....	2.65	2.67	2.39	2.29	2.89	3.48	4.15	3.67	3.15	2.67	2.64	2.18
19.....	2.65	2.56	2.49	2.39	2.95	3.37	4.10	3.67	3.30	2.87	2.84	2.28
20.....	2.64	2.56	2.39	2.28	3.10	3.47	4.15	3.62	3.20	2.77	2.45	2.28
21.....	2.63	2.56	2.38	2.38	3.20	3.47	4.15	3.67	2.90	2.77	2.65	2.28
22.....	2.72	2.56	2.38	2.48	3.20	3.57	4.05	3.67	3.14	2.67	2.45	2.28
23.....	2.71	2.55	2.48	2.47	3.15	3.57	3.95	3.67	2.89	2.77	2.56	2.28
24.....	2.71	2.55	2.47	2.47	3.15	3.57	4.00	3.57	2.89	2.73	2.46	2.28
25.....	2.71	2.55	2.37	2.47	3.16	3.57	4.04	3.47	2.99	2.73	2.56	2.28
26.....	2.71	2.55	2.37	2.36	3.26	3.47	4.04	3.42	3.24	2.78	2.57	2.28
27.....	2.71	2.54	2.36	2.36	3.31	3.47	3.94	3.42	3.09	2.88	2.37	2.28
28.....	2.70	2.44	2.36	2.36	3.26	3.37	3.94	3.42	2.89	2.73	2.57	2.28
29.....	2.70	2.44	2.36	2.55	3.36	3.47	3.99	3.41	3.09	2.73	2.18	2.28
30.....	2.80	.....	2.35	2.55	3.41	3.67	3.94	3.41	3.04	2.79	2.28	2.28
31.....	2.70	.....	2.35	.....	3.26	.....	3.94	3.21	.....	2.74	.....	2.28

LESSER SLAVE RIVER AT SAWRIDGE

Location.—On the SE. $\frac{1}{4}$ Sec. 7, Tp. 73, Rge. 5, W. 5th Mer., at the traffic bridge about 150 feet south of the Sawridge hotel.

Records available.—May 20, 1915, to December 31, 1916.

Gauge.—Vertical staff spiked to upstream pile of fifth bent of bridge from left bank. Elevation of zero maintained at 90.16 feet since establishment.

Bench-mark.—Spike driven in outside pile of north abutment; assumed elevation 100.00 feet.

Channel.—One channel at all stages. Shifts during high stages.

Discharge measurements.—Made from bridge.

Winter flow.—River affected by ice from November to April.

Observers.—C. J. Schurter and T. W. Lyllick.

SESSIONAL PAPER No. 25b

DISCHARGE MEASUREMENTS of Lesser Slave river at Sawridge, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 24	C. M. O'Neil	140	708	0.97	2.62	685
Feb. 18	do	139	843	0.88	2.65	744
Feb. 21	do	138	846	0.90	2.64	764
Mar. 15	do	139	847	0.90	2.54	763
April 14	do	140	786	1.29	2.20	1,016
April 17	do	140	787	1.26	2.18	989
May 13	H. S. Kerby	158	910	1.53	3.10	1,392
June 7	P. H. Daniels	165	996	1.57	3.48	1,560
June 28	do	159	925	1.63	3.20	1,510
July 15	do	173	1,062	1.52	3.80	1,618
July 28	do	176	1,083	1.69	3.95	1,827
Oct. 19	C. McGavin	154	876	1.18	2.80	1,036
Nov. 6	do	150	868	1.37	2.60	1,188
Nov. 20	do	147	688	1.03	2.30	744
Dec. 16	do	138	707	1.06	2.40	753

DAILY GAUGE HEIGHT AND DISCHARGE of Lesser Slave river at Sawridge, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	2.80 ^b	562	2.60	646	2.60	752	2.40	916	2.70	1,217	3.40	1,517
2	2.70	560	2.60	651	2.60	760	2.40	925	2.80	1,249	3.50	1,568
3	2.70	560	2.70	670	2.50	762	2.40	935	2.90	1,286	3.40	1,517
4	2.70	557	2.70	690	2.60	762	2.30	945	2.90	1,286	3.50	1,568
5	2.70	557	2.60	698	2.50	762	2.30	957	2.90	1,286	3.40	1,517
6	2.70	557	2.60	700	2.60	764	2.30	970	2.90	1,286	3.50	1,568
7	2.70	558	2.60	700	2.60	766	2.30	981	2.60	1,189	3.50	1,568
8	2.70	558	2.70	698	2.70	772	2.30	992	2.90	1,286	3.60	1,622
9	2.70	558	2.70	700	2.50	778	2.30	1,000	2.90	1,286	3.50	1,582 ^s
10	2.70	558	2.70	703	2.60	780	2.30	1,010	3.00	1,326	3.50	1,586
11	2.70	558	2.70	715	2.50	780	2.30	1,017	3.10	1,370	3.50	1,590
12	2.70	558	2.70	727	2.50	778	2.30	1,019	3.20	1,417	3.60	1,646
13	2.70	560	2.60	736	2.70	776	2.20	1,020	3.10	1,370	3.60	1,654
14	2.70	560	2.60	740	2.60	773	2.30	1,016	3.10	1,370	3.50	1,604
15	2.70	564	2.70	744	2.50	763	2.30	1,016	3.20	1,417	3.60	1,662
16	2.70	572	2.70	744	2.50	770	2.20	985	3.10	1,370	3.50	1,616
17	2.70	590	2.70	744	2.60	778	2.20	989	3.10	1,370	3.50	1,620
18	2.70	618	2.60	744	2.60	785	2.30	1,000	3.10	1,370	3.20	1,464
19	2.70	656	2.70	750	2.60	795	2.30	1,040	3.10	1,370	3.20	1,468
20	2.80	676	2.70	756	2.60	799	2.30	1,110	3.40	1,517	3.50	1,628
21	2.70	688	2.70	764	2.60	804	2.40 ^b	1,160	3.30	1,467	3.40	1,580
22	2.70	696	2.60	768	2.60	814	2.50	1,165	3.30	1,467	3.30	1,534
23	2.70	696	2.60	750	2.60	820	2.50	1,165	3.30	1,467	3.30	1,538
24	2.60	685	2.60	747	2.60	827	2.50	1,165	3.30	1,467	3.30	1,541
25	2.60	650	2.60	750	2.50	836	2.40	1,142	3.30	1,467	3.40	1,593
26	2.60	640	2.60	746	2.60	844	2.60	1,189	3.30	1,467	3.40	1,598
27	2.60	640	2.50	740	2.50	852	2.70	1,217	3.30	1,467	3.30	1,550
28	2.60	644	2.60	740	2.50	865	2.80	1,249	3.30	1,467	3.30	1,553
29	2.70	660	2.60	743	2.40	877	2.70	1,217	3.30	1,467	3.40	1,600
30	2.60	660	.....	.....	2.40	888	2.70	1,217	3.30	1,467	3.40	1,592 ^s
31	2.60	648	.....	.....	2.40	902	.....	.....	3.55	1,595	.....	.....

^b Ice conditions from January 1 to April 21.^s Shifting conditions from June 9 to June 30.

DAILY GAUGE HEIGHT AND DISCHARGE of Lesser Slave river at Sawridge, for 1916—*Concluded*

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	3.40	1,583s	3.90	1,786	2.90	1,246	2.80	1,152	2.90	1,200	2.40	745
2....	3.40	1,572	3.90	1,785	3.00	1,286	2.70	1,122	2.00	1,040	2.30	745
3....	3.40	1,562	3.90	1,784	3.00	1,283	2.80	1,146	2.40	1,110	2.20	748
4....	3.95	1,850	3.90	1,783	3.20	1,362	2.70	1,116	2.60	1,165	2.50	750
5....	3.70	1,695	3.90	1,782	3.10	1,320	2.70	1,112	2.50	1,150s	2.40	752
6....	3.70	1,685	3.90	1,781	3.10	1,315	2.80	1,124	2.60	1,188	2.40	756
7....	3.70	1,672	3.90	1,780	3.10	1,310	2.70	1,092	2.50	1,170	2.40	758
8....	3.70	1,658	4.20	1,960	3.30	1,395	2.70	1,090	2.50	1,160	2.50	756
9....	3.80	1,700	4.20	1,958	3.40	1,440	2.70	1,088	2.40	1,190	2.50	750
10....	4.10	1,810	4.10	1,900	3.70	1,590	2.70	1,086	2.50	1,165	2.30	742
11....	3.70	1,618	3.80	1,716	3.30	1,390	2.60	1,066	2.00	1,162	2.30	735
12....	3.60	1,550	3.50	1,548	3.30	1,385	2.60	1,064	1.50b	1,020	2.20	730
13....	4.30	1,940	3.50	1,546	3.20	1,340	2.80	1,080	2.00	1,060	2.30	727
14....	4.10	1,806	4.00	1,830	3.10	1,288	2.60	1,045	2.00	1,060	2.30	730
15....	3.80	1,620	3.60	1,600	3.10	1,285	2.60	1,040	2.20	970	2.40	746
16....	3.80	1,630	3.50	1,542	3.10	1,280	2.50	1,020	2.10	890	2.40	753
17....	3.90	1,690	3.80	1,710	3.00	1,240	2.70	1,035	2.20	800	2.30	760
18....	4.00	1,760	3.60	1,590	3.00	1,236	2.60	1,025	2.20	760	2.30	750
19....	4.10	1,825	3.60	1,588	3.80	1,598	2.80	1,036	2.60	750	2.40	730
20....	4.20	1,900	3.50	1,536	2.90	1,204	2.60	1,026	2.30	744	2.40	718
21....	4.20	1,910	3.50	1,535	2.80	1,182	2.80	1,044	2.30	740	2.40	708
22....	4.10	1,850	3.50	1,533	2.80	1,178	2.60	1,032	2.50	740	2.30	672
23....	3.90	1,750	3.40	1,486	2.70	1,152	2.80	1,070	2.40	740	2.30	664
24....	3.90	1,758	3.40	1,485	2.70	1,150	2.60	1,040	2.40	740	2.30	664
25....	3.90	1,765	3.40	1,483	2.70	1,148	2.60	1,046	2.40	740	2.30	664
26....	3.90	1,772	3.30	1,420	3.50	1,410	2.60	1,053	2.40	745	2.30	662
27....	3.90	1,780	3.30	1,418	2.90	1,182	3.00	1,164	2.40	745	2.30	656
28....	4.00	1,850	3.30	1,416	2.80	1,162	2.50	1,072	2.50	745	2.30	650
29....	3.90	1,792	3.40	1,466	2.80	1,160	2.40	1,060	2.40	745	2.30	655
30....	3.90	1,790	3.30	1,412	2.80	1,156	2.70	1,136	2.50	745	2.30	664
31....	3.70	1,670	3.20	1,370	.....	.....	2.80	1,166	.....	.....	2.30b	670

b Ice conditions, November 12 to December 31.

s Shifting conditions, July 1 to November 5.

MONTHLY DISCHARGE of Lesser Slave river at Sawridge, for 1916

(Drainage area 5932 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	696	557	607	0.102	0.12	37,323
February.....	768	646	724	0.122	0.13	41,645
March.....	902	752	799	0.135	0.16	49,129
April.....	1,249	916	1,058	0.178	0.20	62,955
May.....	1,595	1,189	1,384	0.233	0.27	85,099
June.....	1,662	1,464	1,575	0.265	0.30	93,719
July.....	1,940	1,550	1,736	0.293	0.34	106,743
August.....	1,960	1,630	1,630	0.275	0.32	100,225
September.....	1,598	1,148	1,289	0.217	0.24	76,701
October.....	1,166	1,020	1,079	0.182	0.21	66,345
November.....	1,200	740	939	0.158	0.18	55,874
December.....	760	650	716	0.121	0.14	44,025
The year.....	.....	.....	.....	.....	2.61	819,773

SESSIONAL PAPER No. 25B

ATHABASKA RIVER AT ATHABASKA

Location.—On the SE. $\frac{1}{4}$ Sec. 20, Tp. 66, Rge. 22, W. 4th Mer., 400 feet above the ferry cable in the town of Athabaska.

Records available.—March 17, 1914, to December 31, 1916, and discharge measurements during the winters of 1912-13 and 1913-14.

Drainage area.—29,643 square miles; taken from latest available maps which are of small scale and liable to error.

Gauge.—Inclined staff, located on left bank of river, 300 feet above ferry cable and 100 feet below measuring section; zero elevation of gauge maintained at 1,635.38 feet since establishment.

Bench-marks.—Permanent iron bench-mark at foot of ferry cable tower on left bank of river; elevation 1,658.00 feet. Bench-mark on window sill of Grand Union hotel on right bank; elevation 1,668.90 feet.

These elevations are above mean sea-level; Canadian Northern railway datum.

Channel.—One, slightly shifting channel at all stages.

Discharge measurements.—Made from a boat run on a cable.

Winter flow.—Stream affected by ice from November to April.

Observer.—R. Vance.

DISCHARGE MEASUREMENTS of Athabaska river at Athabaska, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 10.....	C. M. O'Neil.....	830	2,198	1.12	3.31	2,552
Feb. 11.....	do.....	667	2,442	0.94	3.17	2,285
Mar. 8.....	do.....	665	2,385	1.00	3.30	2,378
April 4.....	do.....	645	2,666	0.86	3.90	3,093
May 4.....	do.....	693	5,175	2.79	5.00	14,420
May 27.....	H. S. Kerby.....	692	4,797	2.38	4.16	11,411
June 20.....	do.....	816	8,274	4.25	8.60	35,164 _x
June 20.....	do.....	816	8,460	4.46	8.82	37,754
June 21.....	do.....	825	9,089	4.86	9.58	44,200
June 22.....	do.....	813	10,351	5.68	11.10	58,780
June 22.....	do.....	813	9,733	5.15	10.35	50,125 _x
June 23.....	do.....	817	11,308	5.79	12.25	65,473 _x
July 12.....	do.....	835	10,224	5.38	11.01	55,000
Aug. 4.....	do.....	801	7,430	3.78	7.55	28,085 _x
Aug. 24.....	do.....	728	5,728	2.97	5.62	16,997
Sept. 12.....	do.....	745	5,972	3.05	5.88	18,233
Oct. 5.....	W. T. Reeve.....	690	4,402	2.24	3.73	9,877
Dec. 2.....	C. McGavin.....	726	3,115	0.96	3.40	3,001
Dec. 23.....	do.....	680	2,745	1.07	3.31	2,936

_x Slope measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Athabaska river at Athabaska, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	3.61 ^b	2,830	3.14	2,270	3.49	2,980	3.84	3,000	6.25	20,375	4.42	12,272
2....	3.66	2,740	3.14	2,240	3.49	2,930	3.89	3,080	5.18	15,256	4.82	13,780
3....	3.66	2,695	3.09	2,240	3.54	2,940	3.94	3,100	5.04	14,668	4.92	14,180
4....	3.71	2,500	3.14	2,355	3.49	2,930	3.91	3,093	5.00	14,500	5.70	17,600
5....	3.61	2,600	3.14	2,370	3.39	2,700	3.91	3,130	5.80	18,100	5.49	16,605
6....	3.56	2,575	3.14	2,350	3.29	2,300	3.91	3,145	6.23	20,265	5.25	15,555
7....	3.51	2,570	3.14	2,350	3.33	2,315	3.95	3,155	6.21	20,155	5.68	17,500
8....	3.51	2,560	3.14	2,340	3.33	2,378	4.00	3,200	6.14	19,800	5.98	19,000
9....	3.46	2,560	3.19	2,285	3.33	2,400	4.30	3,300	6.06	19,400	6.18	20,000
10....	3.36	2,552	3.14	2,280	3.28	2,365	4.30	3,370	5.81	18,150	5.52	16,740
11....	3.27	2,600	3.15	2,285	3.28	2,300	4.40	3,415	5.55	16,875	5.32	15,856
12....	3.37	2,640	3.15	2,280	3.28	2,275	4.40	3,470	5.23	15,469	5.22	15,426
13....	3.37	2,695	3.15	2,300	3.33	2,330	4.50	3,515	4.84	13,860	5.26	15,596
14....	3.32	2,720	3.20	2,350	3.38	2,445	4.50	3,615	4.60	12,920	5.35	15,985
15....	3.32	2,740	3.20	2,430	3.38	2,500	4.60	3,690	4.35	12,025	5.24	15,512
16....	3.27	2,760	3.20	2,500	3.43	2,530	4.60	3,740	4.18	11,430	5.15	15,130
17....	3.27	2,810	3.20	2,515	3.43	2,600	4.70	3,825	4.04	10,940	5.28	15,684
18....	3.27	2,890	3.20	2,520	3.48	2,680	4.80	3,915	3.89	10,415	6.32	20,760
19....	3.22	2,930	3.20	2,525	3.48	2,720	4.80	4,000	3.75	9,950	7.75	29,660
20....	3.22	3,000	3.20	2,500	3.48	2,735	4.90	4,130	3.72	9,860	8.75	36,825
21....	3.22	3,020	3.20	2,500	3.44	2,740	5.00	4,390	3.70	9,800	9.48	42,370
22....	3.23	3,000	3.20	2,550	3.44	2,730	8.67	12,000	3.74	9,920	10.55	51,085
23....	3.23	2,850	3.34	2,700	3.44	2,725	7.86	13,200	3.91	10,485	12.14	64,504
24....	3.23	2,680	3.49	2,900	3.44	2,700	6.48	15,000	4.16	11,360	12.00	63,300
25....	3.28	2,470	3.59	3,100	3.44	2,695	8.67	17,000	4.39	12,165	10.38	49,676
26....	3.28	2,385	3.59	3,120	3.44	2,700	7.18	16,400	4.35	12,025	9.75	44,510
27....	3.38	2,380	3.54	3,070	3.49	2,690	6.96	18,000	4.15	11,325	9.35	41,363
28....	3.38	2,340	3.54	3,060	3.49	2,700	6.94	18,000	4.04	10,940	9.05	39,075
29....	3.28	2,325	3.54	3,055	3.74	2,750	6.62	18,200	3.95	10,625	8.95	38,325
30....	3.23	2,300	.....	.....	3.79	2,830	6.37 ^b	20,000	4.02	10,870	9.02	38,850
31....	3.23	2,290	.....	.....	3.84	2,920	.....	.....	4.10	11,150	.....	.....

^b Ice conditions from January 1 to April 30.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Athabaska river at Athabaska, for 1916—*Concluded*

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	9.30	40,975	8.47	34,725	5.84	18,300	3.90	10,450	3.73	9,890	3.57	3,030
2....	9.15	39,825	8.21	32,870	5.84	18,300	3.84	10,240	3.57	9,410	3.55	3,000
3....	8.75	36,825	7.94	30,980	5.87	18,450	3.75	9,950	3.26	8,480	3.40	2,970
4....	8.40	34,200	7.50	27,970	5.95	18,850	3.71	9,830	3.21	8,330	3.39	2,960
5....	8.52	35,100	7.57	28,439	6.12	19,700	3.71	9,830	3.13	8,090	3.33	2,970
6....	11.32	57,520	7.66	29,048	6.40	21,200	3.70	9,800	3.10	8,000	3.32	2,970
7....	13.20	73,620	7.73	29,524	6.48	21,640	3.61	9,530	3.05	7,850	3.30	2,940
8....	12.80	70,180	7.56	28,372	6.39	21,145	3.55	9,350	3.00	7,700	2.97	2,920
9....	12.15	64,590	7.14	25,622	6.45	21,475	3.48	9,140	3.00	7,700	3.05	2,890
10....	11.40	58,200	6.92	24,244	6.38	21,090	3.40	8,900	2.89	7,370	3.24	2,880
11....	11.08	55,492	6.90	24,120	6.03	19,250	3.39	8,870	2.84	7,220	3.23	2,890
12....	10.99	54,737	7.00	24,740	5.94	18,800	3.37	8,810	2.79	7,075	3.20	2,900
13....	11.21	56,585	7.14	25,622	5.82	18,200	3.33	8,690	3.39 ^b	6,500	3.05	2,940
14....	11.16	56,164	6.80	23,500	5.50	16,650	3.23	8,390	3.49	5,800	3.02	2,950
15....	10.99	54,737	6.46	21,530	5.28	15,684	3.17	8,210	3.59	5,250	3.00	2,950
16....	10.93	54,239	6.17	19,950	5.03	14,626	3.17	8,210	3.79	4,950	2.94	2,940
17....	10.76	52,823	6.08	19,500	4.88	14,020	3.19	8,270	4.13	4,750	2.74	2,900
18....	9.99	46,478	6.19	20,050	4.68	13,232	3.16	8,180	3.88	4,625	2.59	2,900
19....	9.27	40,742	6.48	21,640	4.50	12,560	3.34	8,720	3.89	4,530	2.94	2,900
20....	9.30	40,975	6.70	22,900	4.35	12,025	3.53	9,290	3.90	4,420	3.14	2,900
21....	9.50	42,525	6.54	21,970	4.22	11,570	4.48	12,488	3.85	4,290	3.19	2,930
22....	9.22	40,355	5.98	19,000	4.19	11,465	4.95	14,300	4.02	4,130	3.39	2,930
23....	8.62	35,850	5.80	18,100	4.12	11,220	4.63	13,037	4.00	3,980	3.34	2,940
24....	8.38	34,060	5.60	17,100	4.12	11,220	4.41	12,236	3.99	3,830	3.19	2,920
25....	8.07	31,890	5.42	16,290	3.99	10,765	4.31	11,885	3.94	3,650	3.34	2,900
26....	7.68	29,184	5.40	16,200	3.93	10,555	4.27	11,745	3.90	3,500	3.30	2,910
27....	7.38	27,170	5.66	17,400	3.97	10,695	4.22	11,570	3.88	3,370	3.33	2,920
28....	7.19	25,937	5.92	18,700	4.01	10,835	4.14	11,290	4.00	3,270	3.34	2,920
29....	7.69	29,252	5.99	19,850	4.00	10,800	4.04	10,940	3.80	3,170	3.33	2,920
30....	8.92	38,100	5.90	18,600	3.98	10,730	3.90	10,450	3.79	3,100	3.31	2,920
31....	8.86	37,650	5.89	18,550	.....	.....	3.81	10,135	.....	.....	3.32 ^b	2,900

^b Ice conditions from November 13 to December 31.

MONTHLY DISCHARGE of Athabaska river at Athabaska, for 1916

(Drainage area 29,643 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	3,020	2,290	2,645	0.089	0.10	162,634
February.....	3,120	2,240	2,529	0.085	0.09	145,482
March.....	2,980	2,275	2,630	0.089	0.10	161,712
April.....	20,000	3,000	7,369	0.249	0.28	438,486
May.....	20,375	9,800	13,712	0.463	0.53	843,118
June.....	64,504	12,272	27,757	0.936	1.04	1,651,657
July.....	73,620	25,937	45,032	1.519	1.75	2,768,910
August.....	34,725	16,200	23,132	0.780	0.90	1,422,331
September.....	21,640	10,555	15,502	0.523	0.58	922,433
October.....	14,300	8,180	10,088	0.340	0.39	620,257
November.....	9,890	3,100	5,808	0.196	0.22	345,600
December.....	3,030	2,880	2,929	0.099	0.11	180,067
The year.....	.....	.....	.....	.....	6.09	9,662,747

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Athabaska River Drainage Basin, in 1916

Date	Engineer	Stream	Location	Width	Area of Section	Mean Velocity	Dis-charge
				Feet	Sq. Feet	Feet per sec.	Sec.-Feet
Jan. 7...	R. J. McGuinness.	Embarras river ...	SW. 5-52-18-5...	70.0	108.00	0.22	23.00
Feb. 24...	do	do	do	40.0	22.50	0.54	12.20
Mar. 22...	do	do	do	70.0	56.00	1.20	67.00
April 7...	do	do	do	185.0	297.00	2.61	776.00
April 25...	do	do	do	122.0	182.50	0.90	165.00 _x
May 19...	C. McGavin.	do	do	122.0	175.10	1.04	183.00
June 12...	do	do	do	195.0	236.70	2.98	707.00
June 21...	do	do	do	178.0	867.80	2.31	2006.00 _x
July 2...	do	do	do	141.0	328.00	2.29	754.00
July 24...	do	do	do	127.0	203.80	2.10	428.00 _x
Aug. 12...	do	do	do	125.0	212.95	1.92	409.00
Sept. 3...	W. T. Reeve	do	do	174.0	165.00	2.64	436.00
Sept. 27...	do	do	do	129.0	95.85	2.19	211.00
Oct. 25...	do	do	do	160.0	137.40	2.73	375.00
May 15...	C. McGavin	Fiddle river...	SE. 15-49-27-5	32.0	21.30	2.02	43.00
Aug. 7...	do	do	do	48.0	47.40	3.02	143.00
June 8...	do	Happy creek ...	SE. 14-51-25-5	6.0	2.95	0.57	1.69
Sept. 2...	W. T. Reeve	do	do	6.5	3.35	0.65	2.20
June 8...	C. McGavin.	Hardisty creek...	SE. 24-51-25-5	8.5	6.20	0.60	3.80
July 18...	do	do	do	13.5	14.22	1.03	14.70
Sept. 1...	W. T. Reeve	do	do	12.0	5.95	0.80	4.80
Sept. 22...	do	do	do	9.5	3.35	0.40	1.41
Aug. 1...	P. H. Daniels.	Heart river ...	SW. 31-75-16-5	62.0	272.00	1.23	335.00
Sept. 17...	W. T. Reeve	Maligne river	Above gorge...	45.0	34.00	1.93	66.00
Aug. 11...	C. McGavin.	Muskeg creek...	SW. 15-54-16-5	67.0	67.25	0.66	44.00
Oct. 6...	W. T. Reeve	do	NW. 17-66-22-4	15.0	14.60	0.24	6.20
Dec. 4...	C. McGavin.	do	do	12.0	1.92	0.23	0.44
May 13...	do	Prairie creek...	SE. 5-51-25-5	32.0	17.40	1.04	18.10
June 7...	do	do	do	45.0	37.00	1.55	58.00
June 28...	do	do	do	51.0	47.00	2.21	104.00
July 18...	do	do	do	41.0	37.80	1.23	47.00
Aug. 9...	do	do	do	45.0	45.75	1.66	76.00
Sept. 1...	W. T. Reeve	do	do	37.0	29.65	0.95	28.00
Sept. 22...	do	do	do	33.0	24.90	0.76	18.70
Oct. 22...	do	do	do	35.0	28.20	0.86	24.00
June 10...	P. H. Daniels	East Prairie river...	SW. 11-74-16-5	73.0	152.00	1.40	212.00
Aug. 3...	do	do	do	74.0	204.00	1.11	227.00
June 9...	do	West Prairie river	SW. 14-74-17-5	74.0	79.90	1.42	114.00
June 27...	do	do	do	75.0	42.00	0.93	39.00
Mar. 31...	R. J. McGuinness	Snaring river...	NW. 33-46-1-6	15.0	8.50	0.37	3.10
April 17...	do	do	do	22.0	21.50	2.49	54.00
May 11...	C. McGavin.	do	do	84.0	118.40	3.49	414.00
June 3...	do	do	do	163.0	249.60	3.55	886.00
June 20...	do	do	do	246.0	590.60	9.10	5374.00 _x
June 25...	do	do	do	246.0	532.00	6.94	3692.00 _x
July 16...	do	do	do	246.0	493.00	6.47	3190.00 _x
Aug. 6...	do	do	do	138.0	207.30	3.89	807.00
Aug. 25...	do	do	do	125.0	194.00	3.30	641.00
Sept. 19...	W. T. Reeve	do	do	106.0	109.90	2.93	322.00
Oct. 18...	do	do	do	93.0	149.60	5.33	798.00
May 19...	C. McGavin.	Sundance creek...	SW. 3-53-18-5	20.0	21.50	1.56	33.00
June 12...	do	do	do	36.0	33.25	1.13	38.00
July 2...	do	do	do	25.0	19.00	1.93	37.00
July 24...	do	do	do	36.0	34.90	0.88	31.00
Aug. 12...	do	do	do	31.0	22.80	1.77	40.00
Oct. 24...	W. T. Reeve	do	do	37.0	32.10	1.31	41.00
Oct. 6...	do	Tawatinaw creek...	SE. 19-66-22-4	24.0	28.20	0.70	19.70
Dec. 4...	C. McGavin.	do	do	43.7	9.65	0.89	8.60
May 17...	do	Wolf creek...	SW. 3-54-16-5	80.5	91.17	1.10	101.00
July 1...	do	do	do	85.6	101.79	2.02	205.00
Aug. 11...	do	do	do	71.0	64.90	1.26	82.00
Sept. 4...	W. T. Reeve	do	do	76.0	82.50	1.19	98.00
Sept. 25...	do	do	do	73.0	62.70	0.77	49.00

_x Slope measurement.

NORTH SASKATCHEWAN RIVER DRAINAGE BASIN

General Description

The North Saskatchewan river draws its principal water supply from the eastern slope of the Rocky mountains. The basin is bounded on the south by those of the Red Deer and South Saskatchewan rivers and on the north by those of the Athabaska and Churchill rivers. The general trend of the stream from its source to where it joins the South Saskatchewan, a few miles below the city of Prince Albert, and forms the Saskatchewan river, is easterly.

The basin of the river easily divides itself into five parts or divisions, each of which requires a separate description for a clear understanding of the conditions of run-off.

The first, or upper section, consists of the eastern slope of the Rocky mountains. While this part of the basin is not the greatest area, it supplies the greater part of the run-off. In glaciers and the perpetual snows of the higher peaks, innumerable small streams rise which form the main stream and its larger tributaries. These streams have well-defined rocky valleys and considerable fall. The upper regions of this section are not well wooded, and allow a rapid run-off of melting snow and rain.

East of this first section is a division consisting of the foot-hills, which are, for the most part, well covered with forest and vegetable growth, forming probably the largest area of the five sections. Here also is a very large source of supply for the stream, but due to its cover, a more regulated supply than in the first section. In this section the main stream is joined by the Clearwater and Brazeau rivers, two of the most important tributaries of the whole basin. The streams in this section flow through deep valleys with fairly permanent beds and medium slopes.

From a little west of the city of Edmonton to the mouth of the Vermilion river the country is of a parklike nature with large stretches of prairie. This section is small in area and has not a very large run-off. The principal tributaries are the Sturgeon and Vermilion rivers, the first of which drains in from the wooded country of the north, the latter from the prairie section of the south. The main stream is in a well defined valley with large flats along its course and a more or less permanent bed with a small slope.

Below the third section to a little above the city of Prince Albert is a division which has little drainage into the river. It consists of prairie uplands for the most part, with small patches of timber to the north. The stream widens out into shallow reaches, full of shifting sand bars and has very little slope. The valley, while still well defined, is also much wider. In this section the main stream is fed by the Battle river, which has its source at the outlet of Battle lake, and flows eastward through park land and prairie sections south of the main river, until it empties into the latter at the town of Battleford.

The east division is one in which the river with a greater slope and more permanent bed, narrows considerably, as does also the valley. The run-off in this division is mostly from the north, which consists of well wooded country drained by a number of small streams.

Reports of floods in this basin may be found on pages 30 and 31 of the Report of the Progress of Stream Measurements for 1912, and Appendix No. 4 of the 1915 report.

MISTAYA RIVER NEAR MOUTH OF STREAM

Location.—Sec. 33, Tp. 34, Rge. 20, W. 5th Mer., and about one-quarter mile above mouth of stream.

Records available.—Discharge measurements during open water seasons of 1915 and 1916.

Gauge.—None established.

Bench-mark.—Standard wooden, located on left bank about 250 feet above cable; assumed elevation 100.00 feet.

Channel.—The banks are fairly permanent but the bed, consisting of gravel and boulders, is liable to washout and refill during floods.

Daily measurements.—Made from a cable throughout 1916.

Winter flow.—Stream affected by ice from November to May.

Floods.—During the high water of June, 1916, the gravel bar in centre of channel at section was washed out. There were no indications of the banks overflowing during the entire season 1916. The elevation of high water-mark for the season was 96.00 feet relative to bench-mark.

Observer.—None available.

DISCHARGE MEASUREMENTS of Mistaya river near mouth of stream, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
July 3.....	C. M. O'Neil.....	50.0	137.0	6.55	95.86x	898
Aug. 3.....	do.....	52.0	143.0	6.79	95.90x	972
Oct. 20.....	do.....	40.5	69.0	3.78	94.85x	263

x Water surface elevation referred to bench-mark.

SIFFEUR RIVER NEAR WILSON'S RANCH

Location.—Tp. 35, Rge. 17, W. 5th Mer., about three miles south of the Wilson Ranger cabin and one and one-half miles above the mouth of the stream.

Records available.—Gauge heights May 17 to May 29, 1915. Discharge measurements during the open water seasons 1915 and 1916.

Gauge.—Vertical staff; zero maintained at 89.18 feet during 1915. New gauge section used for water surface elevation in 1916 and no gauge installed.

Bench-mark.—Standard wooden, located on the left bank about twenty-five feet down stream from cable; assumed elevation 100.00 feet.

Channel.—Permanent, consisting of rock banks and gravel bed.

Discharge measurements.—Made from a cable and by wading.

Winter flow.—Stream affected by ice from November to May.

Floods.—On June 29, 1916, the stream was at its maximum stage. The water surface elevation was 89.54 feet, which is one foot above normal and the corresponding discharge measured was 1,543 sec.-ft.

Observer.—None available.

DISCHARGE MEASUREMENTS of Siffleur river near Wilson's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 9.....	O. H. Hoover.....	54.7	97.1	1.34	87.71x	130
May 15.....	do.....	53.0	88.8	1.17	87.64x	104
June 29.....	C. M. O'Neil.....	55.0	232.0	6.65	89.54x	1,543
July 5.....	do.....	55.0	228.0	6.01	89.35x	1,371
Aug. 1.....	do.....	54.7	199.0	5.01	88.93x	996
Aug. 5.....	do.....	55.0	192.0	4.78	88.78x	920
Sept. 16.....	do.....	52.0	140.0	2.56	88.10x	359
Oct. 18.....	do.....	52.5	137.0	2.24	88.07x	307
Oct. 21.....	do.....	52.5	135.0	1.95	87.93x	263

x Water surface elevation referred to bench-mark.

SESSIONAL PAPER No. 25b

NORTH SASKATCHEWAN RIVER AT WILSON'S RANCH

Location.—Sec. 23, Tp. 36, Rge. 18, W. 5th Mer., and about one-half mile southwest of the Wilson Forest Ranger cabin.

Records available.—Discharge measurements May 18 to October 29, 1915, and from March 22 to October 23, 1916. Gauge heights May 15 to May 31, 1915, and from June 17 to October 23, 1916.

Gauge.—Stevens continuous water stage recorder; elevation of zero maintained at 85.13 feet. Staff for checking purposes maintained at same datum.

Bench-mark.—Standard wooden, located on the right bank two hundred and twenty feet below cable; assumed elevation 100.00 feet.

Channel.—Well defined and fairly permanent, consisting of sand, gravel and boulders.

Discharge measurements.—Made from a cable.

Winter flow.—During normal seasons the stream is affected by ice from early in November to May.

Floods.—On June 19, 1916, a maximum gauge height of 10.34 feet was reached, but owing to the low temperatures at night no abnormal flooding occurred and very little debris was moved.

Accuracy.—The daily discharges computed from June 17 to October 23, 1916, are based upon the mean daily gauge heights taken from the continuous record of an automatic gauge and are well within the required degree of accuracy. The open water discharge curve passes through eight out of ten points plotted from ten measurements throughout the season, the other two points plot very close to the curve. The daily discharges computed and estimated for the eight months, not included in above period, are based upon discharge measurements and temperature graphs; also upon the daily discharge at Saunders, ninety miles down stream, where records have been observed to correspond closely throughout the year. These discharges are therefore only fair estimates.

DISCHARGE MEASUREMENTS of North Saskatchewan river at Wilson's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 22.....	O. H. Hoover.....	170.0	222	1.15	6.17	256 <i>i</i>
May 8.....	do.....	180.0	432	2.60	4.33	1,123
May 16.....	do.....	174.0	330	2.18	3.76	719
June 22.....	C. M. O'Neil.....	206.0	1,425	6.49	8.76	9,241
June 29.....	do.....	204.0	1,363	6.08	8.45	8,287
July 5.....	do.....	200.0	1,114	5.65	7.75	6,289
July 5.....	do.....	200.0	1,114	5.65	7.75	6,289 _x
July 31.....	do.....	201.0	1,054	5.25	7.29	5,530
July 31.....	do.....	201.0	1,054	5.25	7.29	5,530 _x
Aug. 7.....	do.....	202.5	1,098	5.40	7.52	5,928
Sept. 15.....	do.....	190.0	639	3.53	5.33	2,255
Oct. 17.....	do.....	195.0	882	4.65	6.38	4,104
Oct. 23.....	do.....	192.0	520	2.81	4.67	1,464

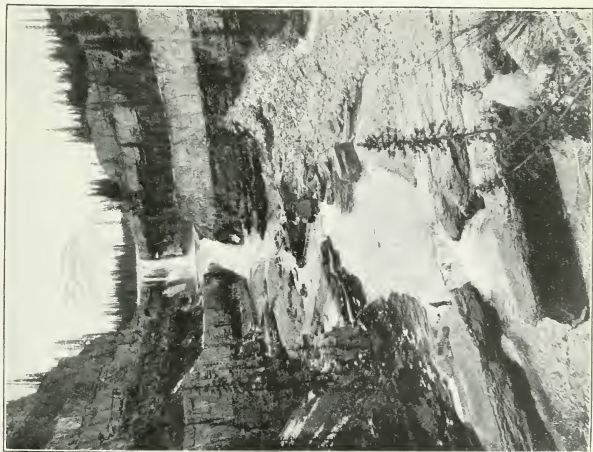
i Stream frozen over.

x Slope measurement.

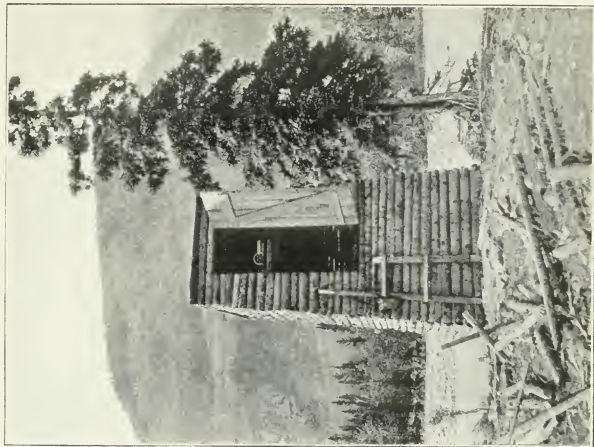
DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan river at Wilson's ranch, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.		326 ^b		228		267		316		710		1,480 ^e
2.		325		220		267		320		765		1,510 ^e
3.		323		214		266		324		834		1,620 ^e
4.		320		212		262		330		914		1,670 ^e
5.		320		212		258		334		1,090		1,840 ^e
6.		320		212		256		338		1,118		1,920 ^e
7.		320		210		255		340		1,122		2,000 ^e
8.		320		210		253		344	4.33	1,123		2,200 ^e
9.		318		210		250		350		1,122		2,600 ^e
10.		316		210		248		354		1,120		3,200 ^e
11.		316		210		244		360		1,090		4,000 ^e
12.		312		210		240		364		1,000		4,300 ^e
13.		304		208		240		370		910		5,000 ^e
14.		294		210		240		376		840		8,060 ^e
15.		285		212		240		380		765		9,100 ^e
16.		270		218		240		386		719		11,200 ^e
17.		262		222		240		393		720 ^e	9.45	12,250
18.		258		228		242		400		700 ^e	10.24	16,544
19.		256		234		244		410		710 ^e	10.34	17,704
20.		255		240		248		422 ^b		720 ^e	10.12	15,872
21.		258		248		252		436		720 ^e	9.64	13,256
22.		260		256	6.17	256 ^d		450		730 ^e	8.76	9,286
23.		260		262		262		467		745 ^e	8.23	7,644
24.		260		266		270		484		766 ^e	8.03	7,084
25.		260		268		275		504		780 ^e	8.23	7,644
26.		256		268		282		527		800 ^e	8.48	8,344
27.		254		268		288		558		920 ^e	8.56	8,604
28.		254		268		294		590		1,040 ^e	8.75	9,250
29.		250		268		302		628		1,200 ^e	8.63	8,842
30.		248				306		660		1,380 ^e	7.96	6,906
31.		238				312				1,460 ^e		

^b Ice conditions from January 1 to April 20.^d Actual measurement.^e Discharge estimated.



Falls on Bighorn river near Nordlogge, Alberta, Taken on October 26, 1916, by C. M. O'Neil.



Shelter for automatic gauge on North Saskatchewan river at Wilson's ranch, made almost entirely of poles cut at the site. Taken on September 17, 1916, by C. M. O'Neil.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan river at
Wilson's ranch, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	7.81	6,544	7.70	6,280	7.92	6,808	4.63	1,430	.....	840b	.....	398
2....	8.12	7,336	7.90	6,760	8.30	7,840	4.50	1,300	.....	810	.....	386
3....	8.23	7,644	8.05	7,140	8.11	7,308	4.38	1,202	.....	770	.....	374
4....	8.28	7,784	7.57	5,968	7.85	6,640	4.25	1,095	.....	740	.....	362
5....	7.72	6,328	7.42	5,640	7.78	6,472	4.28	1,120	.....	700	.....	345
6....	7.44	5,680	7.42	5,640	7.28	5,360	4.25	1,095	.....	660	.....	340
7....	7.70	6,280	7.62	6,088	6.87	4,566	4.10	972	.....	630	.....	340
8....	8.88	9,712	7.87	6,088	6.85	4,530	3.95	856	.....	605	.....	342
9....	9.31	11,550	7.81	6,544	6.68	4,224	3.87	802	.....	584	.....	342
10....	9.50	12,500	7.49	5,780	6.22	3,452	3.81	760	.....	560	.....	340
11....	9.32	11,600	7.26	5,320	6.04	3,164	3.78	740	.....	530	.....	338
12....	9.45	12,250	7.25	5,300	6.07	3,212	3.78	740	.....	508	.....	336
13....	10.07	15,592	7.46	5,720	5.83	2,862	3.79	747	.....	490	.....	334
14....	9.18	10,942	7.75	6,400	5.56	2,484	4.07	946	.....	480	.....	333
15....	8.32	17,896	7.84	6,616	5.48	3,376	4.40	1,218	.....	470	.....	332
16....	8.46	8,288	7.58	5,992	5.45	2,340	5.07	1,884	.....	467	.....	332
17....	9.38	11,900	7.08	4,960	5.51	2,414	4.19	3,404	.....	464	.....	331
18....	9.44	12,200	6.83	4,494	5.58	2,512	5.90	2,960	.....	464	.....	331
19....	8.46	8,288	6.43	3,788	5.64	2,596	5.54	2,456	.....	463	.....	331
20....	7.93	6,832	6.23	3,468	5.58	2,512	5.23	2,076	.....	460	.....	331
21....	7.44	5,680	6.17	3,372	5.37	2,244	5.01	1,812	.....	458	.....	332
22....	7.14	5,080	6.60	4,080	5.43	2,316	4.80	1,600	.....	454	.....	330
23....	6.92	4,656	7.37	5,540	5.48	3,376	4.70	1,500	.....	450	.....	330
24....	6.72	4,296	7.75	6,400	5.48	3,376	.....	1,414e	.....	448	.....	330
25....	7.02	4,840	7.73	6,352	5.57	2,498	.....	1,340e	.....	442	.....	328
26....	7.38	5,560	7.72	6,328	5.32	2,184	.....	1,220e	.....	438	.....	324
27....	7.48	5,760	7.70	6,280	5.01	1,812	.....	1,132e	.....	432	.....	324
28....	7.36	5,520	7.70	6,280	4.80	1,600	.....	1,040e	.....	424	.....	326
29....	7.07	4,940	7.72	6,328	4.68	1,480	.....	960e	.....	416	.....	332
30....	7.08	4,960	7.73	6,352	4.71	1,510	.....	920e	.....	408	.....	340
31....	7.29	5,380	7.90	6,760	.....	.....	.....	875e	.....	.....	.....	348b

b Ice conditions November 1 to December 31.

e Discharge estimated.

For accuracy of daily discharges, November and December, see Accuracy Notes in description of station.

MONTHLY DISCHARGE of North Saskatchewan river at Wilson's ranch, for 1916

(Drainage area 952 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	326	238	285	0.299	0.34	17,524
February.....	268	208	231	0.243	0.26	13,287
March.....	312	240	261	0.274	0.32	16,048
April.....	660	316	417	0.438	0.49	24,813
May.....	1,460	700	923	0.969	1.12	56,753
June.....	17,704	1,480	7,031	7.385	8.24	418,374
July.....	17,896	4,296	8,188	8.600	9.92	503,460
August.....	7,140	3,372	5,763	6.050	6.98	354,353
September.....	7,840	1,480	3,569	3.750	4.18	212,370
October.....	3,404	740	1,342	1.410	1.63	82,516
November.....	840	408	536	0.563	0.63	31,894
December.....	398	324	340	0.357	0.41	20,906
The year.....	.....	.....	.....	.....	34.52	1,752,298

WHITERABBIT CREEK AT WILSON'S RANCH

Location.—Tp. 36, Rge. 18, W. 5th Mer., about one-half mile northeast from the Wilson Forest Ranger cabin.

Records available.—Gauge heights May 16 to May 31, 1915. Discharge measurements during open water seasons 1915 and 1916.

Gauge.—None established during 1916.

Channel.—Shifting; consisting of sand and gravel.

Discharge measurements.—Made by wading or from a temporary cable.

Winter flow.—Stream affected by ice from November to May.

Floods.—The maximum flow during 1916 occurred about July 5, on which date the measured discharge was 250 sec.-ft.

Observer.—None available during 1916.

DISCHARGE MEASUREMENTS of Whiterabbit creek at Wilson's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 8.....	O. H. Hoover.....	13.0	6.40	1.97	.....	12.6
May 16.....	do.....	10.5	4.17	1.08	.....	4.5
June 29.....	C. M. O'Neil.....	44.0	37.4	4.26	.....	159.0
July 5.....	do.....	45.0	50.50	4.95	.....	250.0
July 31.....	do.....	21.5	15.70	2.54	.....	40.0
Aug. 7.....	do.....	24.0	19.60	3.13	.....	61.0
Sept. 16.....	do.....	17.5	12.60	2.00	.....	25.0
Oct. 17.....	do.....	19.0	10.40	2.79	.....	29.0
Oct. 22.....	do.....	18.0	7.91	2.02	.....	16.0

Water surface elevation of no value as stream changed its channel continually between measurements.

CLINE RIVER NEAR MOUTH OF STREAM

Location.—Tp. 37, Rge. 18, W. 5th Mer., about three miles above mouth of stream.

Records available.—Discharge measurements only during open water seasons 1915 and 1916.

Gauge.—None established.

Bench-mark.—Standard wooden; located on the left bank, 250 feet down stream from the cable; assumed elevation 100.00 feet.

Channel.—Shifting, consisting of rock, gravel and sand.

Discharge measurements.—Made from a cable or by wading.

Winter flow.—Stream affected by ice from November to May.

Floods.—During June, 1916, the stream was in flood, overflowing its banks about one mile below the cable station, but not at cable. The maximum elevation of the water surface was 89.18 feet relative to the bench-mark and the estimated discharge 6,657 sec.-ft.

Observer.—None available.

DISCHARGE MEASUREMENTS of Cline river near mouth of stream, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 21.....	O. H. Hoover.....	51.0	68.1	1.28	83.12x	87.0
Mar. 24.....	do.....	51.0	76.2	1.26	83.10x	96.0
May 7.....	do.....	64.5	96.4	2.96	84.15x	285.0
May 17.....	do.....	55.0	94.0	2.12	83.84x	199.0
June 16.....	C. M. O'Neil.....	82.0	555.0	12.00	89.18x	6,657.0e
July 6.....	do.....	76.0	146.2	7.06	84.98x	1,031.0
July 29.....	do.....	74.0	193.4	6.00	84.28x	1,157.0
Aug. 8.....	do.....	78.5	222.5	6.22	84.62x	1,384.0
Aug. 14.....	do.....	78.0	203.5	5.96	84.30x	1,217.0
Sept. 14.....	do.....	103.0	158.4	3.83	83.07x	607.0n
Oct. 24.....	do.....	75.5	115.6	3.06	82.35x	354.0

x Water surface elevation referred to bench-mark.

e Discharge estimated.

n Discharge measured at miscellaneous section 5,000 feet below regular section.

SESSIONAL PAPER No. 25b

BIGHORN RIVER NEAR MOUTH OF STREAM

Location.—Tp. 39, Rge. 16, W. 5th Mer., and about two miles above mouth of stream.

Records available.—Discharge measurements only, during open water seasons 1915 and 1916.

Gauge.—None established.

Bench-mark.—Standard wooden, located on the left bank, about 30 feet from water edge and about 100 feet up stream from cable; assumed elevation 100.00 feet. The bench-mark used during 1915 is located 600 feet down stream from cable.

Channel.—Shifting, consisting of sand, gravel and small boulders.

Discharge measurements.—Made from a cable and by wading.

Winter flow.—Affected by ice from November to May.

Floods.—The maximum flow during 1916 occurred about June 19, when the water surface reached an elevation of 92.00 feet; the lower flats were inundated.

Observer.—None available.

DISCHARGE MEASUREMENTS of Bighorn river near mouth of stream, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 5.....	O. H. Hoover.....	56.0	52.0	3.75	89.56 _x	195
May 18.....	do.....	39.5	40.4	2.82	89.29 _x	114
June 15.....	C. M. O'Neil.....	68.0	109.6	6.46	90.18 _x	707
July 7.....	do.....	51.0	80.9	5.98	90.40 _x	484
July 28.....	do.....	79.0	86.6	5.23	90.13 _x	453
Aug. 16.....	do.....	47.5	50.8	4.13	90.03 _x	210
Sept. 13.....	do.....	44.0	52.3	3.63	89.53 _x	190
Oct. 25.....	do.....	31.0	25.5	2.81	89.10 _x	80 _n
Oct. 26.....	do.....	44.0	35.4	2.41	89.10 _x	85

n Discharge measurement at miscellaneous section 1,000 feet below regular section.

x Water surface elevation referred to bench-mark.

Shifting conditions throughout season.

MARTIN CREEK NEAR NORDEGG

Location.—SE. $\frac{1}{4}$ Sec. 27, Tp. 40, Rge. 15, W. 5th Mer., about one-quarter mile due south of the Canadian Northern railway depot at Nordegg, and three hundred feet up stream from the town power plant.

Records available.—June 12, 1915, to December 31, 1916. From July 11, 1916, to July 25, 1916, no gauge heights were recorded.

Gauge.—Vertical staff; zero maintained at an elevation of 95.31 feet from June 12, 1915, to June 2, 1916, and at an elevation of 94.31 feet from June 2 to end of 1916.

Bench-mark.—Standard wooden, located on the left bank about forty feet down stream from the gauge; assumed elevation 100.00 feet.

Channel.—Shifting, consisting of sand, gravel and clay.

Discharge measurements.—Made by current-meter from a plank spanning creek and by a 15-inch weir.

Winter flow.—Stream affected by ice from November to May.

Floods.—During 1916 there was no excessive flooding. A gauge height of 2.07 on May 1 was the maximum for the open water period.

Observer.—F. Birch, January 1 to July 10, 1916. Wm. Roxborough, July 26 to December 31, 1916.

Accuracy.—The open water discharge curve is defined by twelve measurements well distributed over the season and as all measurements plotted fell fairly close to the curve, the discharges computed from the curve will be well within the required degree of accuracy. Gauge heights were interpolated from July 11 to July 25 inclusive, and may be considered accurate to within 0.03 feet.

DISCHARGE MEASUREMENTS of Martin creek near Nordegg, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		Feet	Sq. ft.	Ft. per sec.	Feet	Sec.-ft.
Feb. 18.....	S. H. Frame.....	Creek	frozen to	bottom	.....	Nil
Mar. 17.....	O. H. Hoover.....	"	"	"	.....	"
May 2.....	do.....	3.30	2.28	1.71	1.99	3.90
May 3.....	do.....	3.40	2.03	0.96	1.85	1.94
May 20.....	do.....	.....	.....	.....	1.55	0.21 ^w
May 22.....	do.....	.....	.....	.....	1.54	0.16 ^w
May 31.....	C. M. O'Neil.....	4.50	2.71	1.52	2.02	4.14
June 13.....	do.....	4.60	1.49	0.48	1.61	0.72
July 25.....	do.....	.....	.....	.....	1.75	1.39 ^w
July 26.....	do.....	6.50	5.88	0.39	1.85	2.28
Aug. 19.....	do.....	6.50	6.00	0.53	1.90	3.19
Aug. 28.....	do.....	6.00	4.89	0.31	1.75	1.50
Sept. 26.....	do.....	.....	.....	.....	1.69	0.67 ^w
Oct. 28.....	do.....	.....	.....	.....	1.58	0.32 ^w
Dec. 5.....	do.....	.....	.....	.....	1.32	0.02 ^{ri}

^w Discharge determined by 15-inch weir.ⁱ Stream frozen over.

DAILY GAUGE HEIGHT AND DISCHARGE of Martin creek near Nordegg, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	Dry ^b	Nil	Dry	Nil	1.37	Nil	2.22	0.10	2.07	4.88	1.97	3.67
2.....	"	"	"	"	1.30	"	2.03	0.20	1.98	3.79	1.95	3.42
3.....	"	"	"	"	1.26	"	2.15	0.30	1.85	2.28	1.94	3.30
4.....	"	"	"	"	1.20	"	2.21	0.40	1.72	1.19	1.82	2.02
5.....	"	"	"	"	1.17	"	2.25	0.44	1.70	1.04	1.80	1.84
6.....	"	"	"	"	0.91	"	2.30	0.46	1.72	1.19	1.76	1.48
7.....	"	"	"	"	0.97	"	2.42	0.50	1.68	0.90	1.70	1.04
8.....	"	"	"	"	1.22	"	2.44	0.52	1.68	0.90	1.67	0.84
9.....	"	"	"	"	1.62	"	2.21	0.54	1.64	0.64	1.67	0.84
10.....	"	"	"	"	1.76	"	2.18	0.56	1.56	0.25	1.66	0.77
11.....	"	"	"	"	1.84	"	2.19	0.58	1.58	0.33	1.65	0.70
12.....	"	"	"	"	1.92	"	2.20	0.58	1.60	0.41	1.61	0.47
13.....	"	"	"	"	1.92	"	2.22	0.60	1.54	0.19	1.60	0.41
14.....	"	"	"	"	1.92	"	1.89	0.62	1.54	0.19	1.60	0.41
15.....	"	"	"	"	1.85	"	2.00	0.64	1.54	0.19	1.60	0.41
16.....	"	"	1.57 ^z	"	0.96	"	1.94	0.68	1.53	0.17	1.60	0.41
17.....	"	"	1.77	"	1.56	"	1.84	0.73	1.54	0.19	1.58	0.33
18.....	"	"	1.77	"	0.92	"	1.84	0.76	1.53	0.17	1.58	0.33
19.....	"	"	1.77	"	1.02	"	1.82	0.82	1.55	0.21	1.57	0.29
20.....	"	"	1.72	"	1.15	"	1.84	0.90	1.55	0.21	1.56	0.25
21.....	"	"	1.72	"	1.75	"	1.84	1.00	1.55	0.21	1.59	0.37
22.....	"	"	1.68	"	2.00	"	1.67	1.08	1.50	0.10	1.59	0.37
23.....	"	"	1.66	"	2.03	"	1.73	1.12	1.60	0.41	1.60	0.41
24.....	"	"	1.40	"	2.00	"	1.80	1.24	1.63	0.58	1.61	0.47
25.....	"	"	1.50	"	2.07	"	1.706	0.58	1.89	2.71	1.62	0.53
26.....	"	"	1.49	"	2.03	"	1.86	2.38	1.86	2.38	1.62	0.53
27.....	"	"	1.49	"	1.92	"	1.84	2.17	2.08	5.00	1.64	0.64
28.....	"	"	1.48	"	1.92	"	1.64	0.64	2.00	4.03	1.62	0.53
29.....	"	"	1.42	"	1.92	"	1.67	0.84	2.03	4.39	1.64	0.64
30.....	"	"	.....	.....	1.97	Nil	1.76	1.48	2.05	4.64	1.64	0.64
31.....	Dry	Nil	.....	.....	2.02	0.04	.....	.....	2.02	4.27	.....	.....

^b Ice conditions from January 1 to April 25.

Feb. 16 to Mar. 30.—Gauge heights recorded are of small amount water flooding over ice during daytime.

^z Gauge is set in pool.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Martin creek near Nordegg, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	1.63	0.58	1.82	2.02	1.74	1.34	1.64	0.64	1.57	0.31	1.32	0.02
2....	1.63	0.58	1.77	1.74	1.77	1.34	1.64	0.64	1.60	0.31	1.32	0.02
3....	1.69	0.98	1.82	2.02	1.78	1.71	1.63	0.58	1.56	0.30	1.45	0.02
4....	1.80	1.84	1.78	1.71	1.84	2.19	1.63	0.58	1.57	0.28	1.45	0.02
5....	1.80	1.84	1.78	1.71	1.76	1.48	1.63	0.58	1.54	0.28	1.40	0.02
6....	1.78	1.71	1.78	1.71	1.74	1.34	1.64	0.64	1.57	0.27	0.95	0.02
7....	1.78	1.71	1.79	1.78	1.75	1.42	1.64	0.64	1.50	0.23	Dry	Nil
8....	1.85	2.28	1.79	1.78	1.75	1.42	1.63	0.58	1.50	0.21	"	"
9....	1.79	1.78	1.90	2.82	1.76	1.48	1.62	0.53	1.50	0.20	"	"
10....	1.77	1.74	1.79	1.78	1.75	1.42	1.61	0.47	1.50	0.20	"	"
11....	1.77 _a	1.74	1.80	1.84	1.74	1.34	1.60	0.41	1.46	0.18	"	"
12....	1.78 _a	1.71	1.80	1.84	1.74	1.34	1.60	0.41	1.45	0.16	"	"
13....	1.79 _a	1.78	1.79	1.78	1.75	1.42	1.60	0.41	1.42	0.14	"	"
14....	1.80 _a	1.84	1.77	1.74	1.75	1.42	1.60	0.41	1.45	0.13	"	"
15....	1.80 _a	1.84	1.73	1.27	1.73	1.27	1.60	0.41	1.50	0.13	1.05 _x	"
16....	1.81 _a	1.93	1.71	1.12	1.72	1.19	1.60	0.41	1.46	0.13	1.40 _x	"
17....	1.81 _a	1.93	1.81	1.93	1.72	1.19	1.63	0.58	1.50	0.13	0.65 _x	"
18....	1.81 _a	1.93	1.92	3.06	1.70	1.04	1.60	0.41	1.72	0.13	Dry	"
19....	1.82 _a	2.02	1.90	2.82	1.68	0.90	1.60	0.41	1.62	0.13	"	"
20....	1.82 _a	2.02	1.90	2.82	1.67	0.84	1.60	0.41	1.55	0.13	"	"
21....	1.83 _a	2.10	1.87	2.50	1.67	0.84	1.60	0.41	1.55	0.12	"	"
22....	1.83 _a	2.10	1.86	2.39	1.67	0.84	1.59	0.37	1.55	0.11	"	"
23....	1.84 _a	2.19	1.82	2.02	1.66	0.77	1.59	0.37	1.50	0.09	"	"
24....	1.84 _a	2.19	1.80	1.84	1.66	0.77	1.58	0.33	1.45	0.07	"	"
25....	1.85 _a	2.28	1.80	1.84	1.69	0.97	1.59	0.37	1.48	0.06	"	"
26....	1.85	2.28	1.78	1.71	1.67	0.84	1.58	0.33	1.35	0.04	"	"
27....	1.85	2.28	1.76	1.48	1.65	0.70	1.57	0.29	1.42	0.04	"	"
28....	1.87	2.50	1.75	1.42	1.64	0.64	1.58	0.33	1.30	0.03	"	"
29....	1.86	2.39	1.74	1.34	1.64	0.64	1.57 _b	0.33	1.38	0.03	"	"
30....	1.84	2.19	1.74	1.34	1.65	0.70	1.56	0.32	1.35	0.03	"	"
31....	1.81	1.93	1.74	1.34	.....	.....	1.57	0.32	.....	.....	"	<i>b</i>

x Ice flooding from melting snow (chinook) and freezes to surface below gauge.*a* Gauge height interpolated.*b* Ice conditions October 29 to December 31.

MONTHLY DISCHARGE of Martin creek near Nordegg, for 1916

(Drainage area 4 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	Nil	Nil	.....	.....	.....	.....
February.....	"	"	.....	.....	.....	.....
March.....	0.04	"	.....	.....	.....	.....
April.....	2.38	0.10	0.78	0.195	0.218	46
May.....	5.00	0.10	1.55	0.388	0.447	95
June.....	3.67	0.25	0.94	0.235	0.262	56
July.....	2.50	0.58	1.88	0.470	0.540	116
August.....	3.06	1.12	1.89	0.472	0.540	116
September.....	2.19	0.64	1.16	0.290	0.320	69
October.....	0.64	0.29	0.45	0.112	0.130	28
November.....	0.31	0.03	0.15	0.038	0.040	9
December.....	0.02	0.00	.....	.....	.....	.....
The year.....	.....	.....	.....	.....	2.50	535

SHUNDA (MIRE) CREEK NEAR SAUNDERS

Location.—Tp. 40, Rge. 13, W. 5th Mer., about two and one-half miles southwest of Saunders on the Canadian Northern railway.

Records available.—June 1 to June 30, 1915; August 4 to November 29, 1915, and January 1 to December 31, 1916.

Gauge.—Vertical staff; elevation of zero maintained at 90.51 feet since establishment.

Bench-mark.—Standard wooden, located on left bank about 100 feet above gauge; assumed elevation 100.00 feet.

Channel.—Fairly permanent, consisting of sand, gravel and rock.

Discharge measurements.—Made from a cable or by wading.

Winter flow.—Stream affected by ice from November to May.

Floods.—No abnormal flooding occurred during the season 1916. The maximum gauge height of 4.20 feet was reached on August 18, 1916.

Observer.—Thos. Rees.

Accuracy.—Gauge heights observed to one-hundredth of a foot daily and time of observation was approximately time of mean daily gauge height.

DISCHARGE MEASUREMENTS of Shunda creek near Saunders, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 21.....	O. H. Hoover.....	14.0	9.60	1.15	.....	11.1 <i>i</i>
Mar. 15.....	do	11.5	11.60	1.81	1.40	21.0
Mar. 29.....	do	10.5	12.00	1.67	1.41	20.0
April 28.....	do	17.3	24.00	1.47	1.65	35.0
April 29.....	do	18.4	25.00	1.68	1.64	42.0
May 25.....	do	37.0	48.00	2.09	2.04	101.0 <i>n</i>
July 12.....	C. M. O'Neil.....	35.0	51.00	2.59	2.22	132.0
July 23.....	do	37.5	36.40	1.74	1.84	63.0
Aug. 21.....	do	68.0	87.60	3.40	2.78	313.0 <i>m</i>
Aug. 25.....	do	35.5	56.00	2.47	2.29	138.0
Sept. 27.....	do	36.5	43.00	1.72	1.90	73.0
Nov. 1.....	do	36.2	39.70	1.56	1.88	62.0
Dec. 6.....	do	30.0	16.80	1.16	1.95	19.5 <i>i</i>

i Stream frozen over.

m Discharge measured at miscellaneous section 500 feet above gauge.

n 100 feet below gauge.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Shunda creek near Saunders, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	1.48 ^b	15.2	3.60	13.5	1.56	17.4	2.39	22	1.75	54	3.52	610
2....	1.48	14.6	3.62	14.0	1.49	17.5	2.41	22	1.72	50	3.22	490
3....	1.48	14.2	3.79	14.2	1.46	17.7	2.43	22	1.72	50	2.59	238
4....	1.50	13.6	3.81	14.4	1.46	18.2	2.42	22	1.72	50	2.51	210
5....	1.50	13.0	3.83	14.6	1.44	18.8	1.59	22	1.72	50	2.51	210
6....	1.50	12.4	3.76	14.7	1.44	19.4	1.59	22	1.70	48	2.38	170
7....	1.50	12.0	3.10	14.9	1.44	20.0	1.60	22	1.70	48	2.29	146
8....	1.50	11.6	2.42	15.2	1.45	20.0	1.62	22	1.70	48	2.15	114
9....	1.52	11.2	1.67	15.3	1.45	21.0	1.64	23	1.71	49	2.15	114
10....	1.53	11.0	1.69	15.6	1.50	21.0	2.65	24	1.68	46	2.20	125
11....	1.53	11.0	1.69	16.0	1.53	22.0	2.61	24	1.66	44	2.23	132
12....	1.53	11.0	2.10	16.3	1.53	22.0	2.64	25	1.64	42	2.23	132
13....	1.55 ^a	11.0	2.56	16.6	1.52	22.0	1.85	25	1.62	40	2.27	140
14....	1.57 ^a	11.0	2.58	16.8	1.47	21.0	1.82	25	1.61	40	2.15	114
15....	1.58 ^a	11.0	2.61	17.2	1.40	21.0	1.82	25	1.62	40	2.04	94
16....	1.60 ^a	11.0	2.65	17.3	1.32	21.0	1.79	25	1.62	40	2.00	88
17....	1.60 ^a	11.0	2.63	17.5	1.32	21.0	1.65	26	1.59	38	1.96	82
18....	1.62 ^a	11.0	1.59	17.5	1.34	21.0	1.69	27	1.59	38	1.95	81
19....	1.62 ^a	11.1	1.59	17.5	1.35	21.0	1.76	27	1.59 ^a	38	1.93	77
20....	1.64 ^a	11.1	1.59	17.5	1.43	21.0	1.85	28	1.60 ^a	38	2.90	362
21....	1.67	11.1	1.61	17.5	1.41	21.0	1.78	29	1.61	40	2.87	350
22....	1.80	11.1	1.63	17.4	1.41	21.0	1.67	30	1.66	44	2.87	350
23....	1.77	11.2	1.65	17.4	1.39	21.0	1.59	31	1.74	53	2.82	330
24....	1.77	11.3	1.65	17.3	1.37	20.0	1.54	32	1.82	62	2.81	326
25....	1.80	11.4	1.69	17.2	1.37	20.0	1.59	33	2.04	94	2.55	224
26....	1.96	11.7	1.72	17.2	1.39	20.0	1.61	34	2.37	167	2.52	213
27....	2.59	11.9	1.79	17.2	1.41	20.0	1.61	34	2.48	200	2.50	206
28....	2.59	12.0	1.76	17.3	1.41	20.0	1.65	35	2.60	242	2.38	170
29....	2.53	12.2	1.68	17.4	1.41	20.0	1.65	40	2.65	262	2.16	117
30....	2.58	12.2	.....	.....	1.40	20.0	1.64 ^b	47	3.21	486	2.33	156
31....	2.59	12.2	.....	.....	1.47	21.0	.....	.....	3.44	578	.....	.....

^a Gauge height interpolated.^b Ice conditions, January 1 to April 30.

DAILY GAUGE HEIGHT AND DISCHARGE of Shunda creek near Saunders, for 1916—*Concluded*

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	2.11	106	2.39	172	2.59	238	1.89	72	1.88	70	1.91	20.0
2....	2.54	220	2.43	184	2.61	246	1.87	69	1.86	68	1.90	20.0
3....	2.10	104	2.54	220	2.90	362	1.87	69	1.83	64	1.90	20.0
4....	3.53	614	2.55	224	3.42	570	1.86	68	1.81	60	1.89	19.0
5....	3.46	586	2.60	242	3.40	562	1.86	68	1.79	58	1.88a	19.0
6....	2.70	281	2.52	213	3.27	510	2.13	110	1.79	58	1.87a	19.0
7....	2.63	254	2.50	206	2.89	358	2.01	90	1.77b	56	1.86	19.0
8....	2.54	220	2.48	200	2.58	234	1.95	80	1.77	50	2.00	19.0
9....	2.64	258	2.74	297	2.45	190	1.92	76	1.76	38	2.03	20.0
10....	2.59	238	2.52	213	2.37	167	1.90	73	1.63	38	2.05	20.0
11....	2.33	156	2.41	178	2.29	146	1.90	73	1.65	38	2.10	20.0
12....	2.22	130	2.27	141	2.23	132	1.89	72	1.79	38	2.00	20.0
13....	2.24	134	2.25	136	2.25	136	1.89	72	2.89	38	1.99	20.0
14....	2.23	132	2.11	106	2.19	123	1.89	72	2.59	37	1.97	20.0
15....	2.21	227	2.07	99	2.15	114	1.89	72	2.13	34	1.92	20.0
16....	2.21	227	2.00	88	2.11	106	1.93	78	2.10	30	1.86	20.0
17....	2.19	123	2.26	139	2.05	96	1.96	82	1.99	28	1.83	20.0
18....	2.48	200	4.20	882	2.00	88	2.01	90	1.95	27	1.81	19.0
19....	2.05	97	3.64	658	1.97	84	2.06	98	1.93	27	1.77	19.0
20....	2.01	90	3.22	490	1.95	80	2.05	96	1.91	27	1.77	19.0
21....	2.00	88	2.78	314	1.91	74	2.03	93	1.90	25	1.76	19.0
22....	1.96	82	2.69	277	1.85	66	2.01	90	1.87	24	1.73	19.0
23....	1.85	66	2.58	235	1.85	66	2.00	88	1.78	23	1.66	19.0
24....	1.89	72	2.39	172	1.83	64	1.99	86	2.05	23	1.66	19.0
25....	2.64	258	2.29	145	1.91	74	2.01	90	2.09	23	1.65	19.0
26....	3.42	570	2.23	132	1.91	74	2.02	91	2.05	23	1.64	18.0
27....	3.95	782	2.14	112	1.90	73	2.01	90	1.90	23	1.60	18.0
28....	3.78	714	2.09	102	1.90	73	1.99	86	1.90	22	1.57	18.0
29....	2.85	342	2.05	96	1.90	73	1.96	82	1.91	22	1.59	18.0
30....	2.63	254	2.01	90	1.89	72	1.91	74	1.91	21	1.63	18.0
31....	2.45	190	2.25	136	.....	.....	1.92	76	.....	.....	1.64b	18.0

b Ice conditions, November 7 to December 31.

a Gauge height interpolated.

MONTHLY DISCHARGE of Shunda creek near Saunders, for 1916

(Drainage area 144 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	15.2	11.0	11.8	0.082	0.09	728
February.....	17.5	13.5	16.3	0.113	0.12	938
March.....	22.0	17.4	20.0	0.141	0.16	1,243
April.....	47.0	22.0	28.0	0.194	0.22	1,666
May.....	578.0	38.0	101.0	0.699	0.80	6,210
June.....	610.0	77.0	206.0	1.430	1.60	12,258
July.....	782.0	66.0	252.0	1.750	2.02	15,495
August.....	882.0	88.0	222.0	1.540	1.78	13,650
September.....	570.0	64.0	175.0	1.220	1.36	10,413
October.....	110.0	68.0	81.0	0.562	0.65	4,980
November.....	70.0	21.0	37.0	0.257	0.29	2,202
December.....	20.0	18.0	19.2	0.133	0.15	1,181
The year.....	.....	.....	.....	.....	9.24	70,964

SESSIONAL PAPER No. 25B

NORTH SASKATCHEWAN RIVER NEAR SAUNDERS

Location.—Sec. 14, Tp. 40, Rge. 13, W. 5th Mer., and about two miles southwest of Saunders on the Canadian Northern railway.

Records available.—August 4 to December 31, 1915, and January 1 to December 31, 1916.

Gauge.—Vertical and slope staff combined; zero maintained at an elevation of 81.18 feet since establishment.

Bench-mark.—Standard wooden, located on the left bank 104 feet above cable; assumed elevation 100.00 feet.

Channel.—Fairly permanent; consisting of gravel, boulders and rock.

Discharge measurements.—Made from a cable.

Winter flow.—Stream affected by ice from November to May.

Floods.—The maximum gauge height during 1916 was 9.63 feet, on June 20. No flooding of banks occurred and only a small amount of debris was carried.

Observer.—Thos. Rees, January 1 to December 31.

Accuracy.—The control remained fairly constant throughout the season. The plot of the gauge heights and discharge measurements gives a very smooth curve and as daily gauge heights were read to one-hundredth of a foot at time of mean daily flow the resulting computations are well within the maximum limit of error.

DISCHARGE MEASUREMENTS of North Saskatchewan river near Saunders, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 22.....	O. H. Hoover.....	68	377	0.88	3.35	332 _i
Mar. 15.....	do.....	65	348	1.31	3.57	454 _i
Mar. 29.....	do.....	65	346	1.32	3.42	457 _i
April 29.....	do.....	249	339	2.51	1.93	852
May 25.....	do.....	271	591	3.15	2.87	1,864
July 12.....	C. M. O'Neil.....	286	2,059	7.34	7.66	15,221
July 22.....	do.....	282	1,395	5.19	5.53	7,241
Aug. 21.....	do.....	280	1,152	4.62	4.71	5,321 _x
Aug. 22.....	do.....	280	1,152	4.62	4.71	5,321
Aug. 25.....	do.....	284	1,578	6.07	6.14	9,575
Sept. 28.....	do.....	272	793	3.70	3.40	2,934
Nov. 1.....	do.....	255	550	3.17	2.42	1,744
Dec. 8.....	do.....	200	514	0.89	2.72	456 _i

_x Slope measurement.

_i Ice conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan river near Saunders, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	3.98 ^b	660	3.62	374	3.45	435	3.57	476	3.14	2,554	3.51	3,098
2....	3.97	640	3.68	380	3.43	434	3.57	488	3.10	2,496	3.79	3,590
3....	3.95	620	3.68	385	3.52	438	3.59	504	2.98	2,322	4.01	3,980
4....	3.98	600	3.66	392	3.54	440	3.59	520	2.98	2,322	3.95	3,870
5....	3.93	570	3.67	400	3.58	445	3.45	536	2.96	2,294	3.91	3,802
6....	3.94	545	3.61	402	3.58	460	3.48	554	2.90	2,210	3.86	3,714
7....	3.95	525	3.50	410	3.67	468	3.48	570	2.87	2,168	3.79	3,590
8....	3.93	520	3.56	420	3.76	482	3.52	586	2.83	2,112	3.72	3,467
9....	3.93	500	3.58	430	3.78	495	3.54	604	2.79	2,056	3.76	3,538
10....	3.94	490	3.60	440	3.98	502	3.56	620	2.56	1,734	3.82	3,643
11....	3.94	485	3.61	448	4.08	506	3.52	640	2.40	1,510	3.85	3,698
12....	3.92	480	3.63	455	3.88	480	3.54	668	2.36	1,454	4.21	4,376
13....	3.86 ^a	480	3.63	462	3.69	468	2.48	710	2.28	1,342	4.27	4,494
14....	3.80 ^a	480	3.67	472	3.67	456	2.46	820	2.26	1,314	4.31	4,574
15....	3.74 ^a	470	3.73 ^a	483	3.66	454	2.43 ^b	1,180	2.19	1,216	5.35	6,875
16....	3.68 ^a	460	3.78 ^a	490	3.52	450	2.36	1,454	2.28	1,342	6.77	11,492
17....	3.62 ^a	440	3.83 ^a	498	3.58	446	2.00	950	2.32	1,398	7.91	16,500
18....	3.56 ^a	420	3.90	500	3.47	446	2.00	925	2.39	1,496	8.38	18,689
19....	3.50 ^a	400	3.97	504	3.46	446	1.98	925	2.47	1,608	9.14	22,208
20....	3.43 ^a	365	3.97	508	3.71	446	1.98	925	2.56	1,734	9.63	24,478
21....	3.36	345	4.09	514	3.66	446	1.98	925	2.79	2,056	9.56	24,153
22....	3.36	332	4.28	520	3.65	448	1.98	925	2.83	2,112	9.00	21,560
23....	3.34	330	4.37	524	3.54	443	1.80	700	2.86	2,154	8.95	21,328
24....	3.32	335	4.50	516	3.49	448	1.93	862	2.90	2,210	8.77	20,495
25....	3.45	340	4.25	505	3.46	448	1.98	925	2.85	2,140	7.74	15,687
26....	3.47	350	4.12	485	3.54	450	2.00	950	2.89	2,196	7.66	15,305
27....	3.59	355	3.73	456	3.60	455	2.12	1,118	2.95	2,280	7.80	15,974
28....	3.59	358	3.56	440	3.51	458	2.09	1,076	3.24	2,700	7.64	15,209
29....	3.56	360	3.48	438	3.42	457	1.95	888	3.62	3,290	7.70	15,496
30....	3.54	365	.....	.....	3.29	460	1.83	738	3.59	3,238	6.84	11,764
31....	3.54	370	.....	.....	3.55	468	.....	.....	3.56	3,186	.....	.....

b Ice conditions January 1 to April 15.

a Gauge height interpolated.

SESSIONAL PAPER No. 25a

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan river near Saunders, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	6.57	10,720	5.73	7,963	6.27	9,691	3.00	2,350	2.42	1,538	2.35	580
2....	6.86	11,840	5.88	8,428	6.35	9,955	2.87	2,168	2.39	1,496	2.49	556
3....	6.90	11,994	6.35	9,955	6.39	10,037	2.78	2,042	2.25	1,300	2.56	536
4....	6.86	11,840	5.98	8,738	6.41	10,153	2.75	2,000	2.20	1,230	2.69	518
5....	6.84	11,763	6.22	9,526	6.19	9,097	2.71	1,944	2.19	1,216	2.67a	500
6....	7.17	13,114	5.86	8,366	6.05	8,965	2.67	1,888	2.13	1,132	2.65a	480
7....	7.19	13,201	5.88	8,428	5.73	7,963	2.65	1,860	2.05b	1,040	2.63	460
8....	7.21	13,287	5.90	8,490	5.49	7,225	2.61	1,804	2.03	1,006	2.75	456
9....	7.61	15,066	6.45	10,285	5.25	6,875	2.57	1,747	2.01	980	2.99	456
10....	8.14	17,578	6.27	9,691	4.83	5,643	2.55	1,720	2.00	960	3.54	458
11....	7.68	15,400	5.95	8,645	4.48	4,712	2.54	1,706	1.92	900	3.56	460
12....	7.70	15,496	5.60	7,560	4.37	4,612	2.53	1,692	1.69	840	3.54	458
13....	8.51	19,291	5.65	7,715	4.25	4,456	2.59	1,776	1.25	406	3.53	456
14....	7.64	15,209	5.83	8,273	4.13	4,218	2.65	1,860	3.95	1,120	3.51	446
15....	6.86	11,840	6.08	9,064	3.90	3,784	2.72	1,958	1.48	640	3.41	440
16....	7.43	14,238	6.16	9,328	3.81	3,626	2.85	2,140	1.76	492	3.29	440
17....	7.95	16,691	6.30	9,790	3.83	3,662	3.29	2,773	1.79	760	3.43	440
18....	7.54	14,731	5.79	8,149	3.83	3,662	3.65	3,344	1.81	848	3.55	440
19....	7.23	13,374	5.40	7,000	3.78	3,572	4.00	3,960	1.79	852	3.62	440
20....	6.46	10,318	5.16	6,400	3.74	3,504	2.65	1,860	1.77	846	3.64	438
21....	5.98	8,738	4.78	5,538	3.69	3,414	2.64	1,846	1.75	838	3.76	438
22....	5.53	7,343	4.70	5,370	3.68	3,396	3.15	2,569	1.73	825	3.83	436
23....	5.36	6,900	5.23	6,700	3.65	3,344	3.10	2,496	1.70	808	3.91	434
24....	5.77	8,087	6.05	8,965	3.69	3,414	2.95	2,280	1.73	792	3.90	428
25....	6.19	9,427	6.14	9,262	3.81	3,626	2.91	2,224	1.75	766	3.89	420
26....	6.54	10,604	6.15	9,295	3.69	3,414	2.87	2,168	1.75	740	3.92	420
27....	6.47	10,351	5.95	8,645	3.45	3,007	2.85	2,140	1.76	720	3.99	422
28....	7.52	14,636	5.87	8,397	3.40	2,934	2.69	1,916	1.85	690	4.03	428
29....	6.75	11,415	5.86	8,366	3.17	2,598	2.58	1,763	1.94	650	4.00	440
30....	5.71	7,901	5.83	8,273	3.09	2,481	2.52	1,678	2.10	615	3.88	456
31....	5.64	7,684	5.94	8,614	.....	.....	2.49	1,636	.....	.....	3.82b	464

b Ice conditions November 7 to December 31.

a Gauge height interpolated.

MONTHLY DISCHARGE of North Saskatchewan river near Saunders, for 1916

(Drainage area 1,903 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	660	330	451	0.237	0.27	27,731
February.....	524	374	457	0.240	0.26	26,287
March.....	506	434	458	0.241	0.28	28,161
April.....	1,454	476	792	0.416	0.46	47,127
May.....	3,290	1,216	2,072	1.090	1.26	127,492
June.....	24,478	3,098	11,022	5.790	6.46	677,716
July.....	19,291	6,900	12,260	6.440	7.42	753,838
August.....	10,285	5,370	8,362	4.390	5.06	514,160
September.....	10,153	2,481	5,236	2.750	3.07	321,949
October.....	3,960	1,636	2,107	1.110	1.28	129,554
November.....	1,538	406	902	0.474	0.53	53,673
December.....	580	420	459	0.241	0.28	28,223
The year.....	.....	.....	.....	.....	26.63	2,735,821

RAM (SHEEP) RIVER NEAR LAMORAL

Location.—Tp. 39, Rge. 11, W. 5th Mer., about one mile above stream mouth.

Records available.—Discharge measurements only during the open water seasons 1915 and 1916.

Gauge.—None established.

Bench-mark.—Standard wooden, located on the right bank 250 feet above cable; assumed elevation 100.00 feet.

Channel.—Fairly permanent; consisting of sand, gravel and shale.

Discharge measurements.—Made from a cable or by wading.

Winter flow.—Stream affected by ice from November to May.

Floods.—During June, 1916, the stream reached its maximum stage for 1916. The water surface elevation was 92.40 feet but the banks did not overflow.

Observer.—None available.

DISCHARGE MEASUREMENTS of Ram river (formerly Sheep river) near Lamoral, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 26.	C. M. O'Neil.	175	525	4.40	91.53 _x	2,310 _e
July 20.	do.	230	374	2.42	90.94 _x	907
Aug. 23.	do.	236	612	3.73	91.78 _x	2,283
Oct. 7.	do.	226	296	1.78	90.41 _x	526
Nov. 4.	do.	206	254	1.61	90.30 _x	409

_x Water elevation referred to bench-mark.

_e Discharge estimated.

CLEARWATER RIVER NEAR ROCKY MOUNTAIN HOUSE

Location.—On the SE. $\frac{1}{4}$ Sec. 16, Tp. 39, Rge. 7, W. 5th Mer., on G. Fletcher's farm, three miles southwest of Rocky Mountain house.

Records available.—January 1, 1914, to December 31, 1916.

Gauge.—Chain gauge, located on left bank of river sixty feet up stream from the cable. There is a staff gauge on the right bank of the river, and in the same section, which is used by the observer during the open water season. The zero elevation of the gauges has been maintained at 3,105.04 feet since establishment.

Bench-mark.—Permanent iron bench-mark, three feet up stream from the cable tower on the right bank. Its elevation is 3,118.39 feet (Department of Public Works of Canada datum).

Channel.—One permanent channel at low water, and probably two in high stages.

Discharge measurements.—Made from a cable car.

Winter flow.—Stream affected by ice from November to April, and measurements are made 300 feet below the cable section.

Observer.—G. Fletcher.

SESSIONAL PAPER No. 25b

DISCHARGE MEASUREMENTS of Clearwater river near Rocky Mountain house, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 20.	O. H. Hoover.	200	325	1.06	4.11	343
Feb. 17.	S. H. Frame.	201	300	1.01	4.38	304
Mar. 13.	O. H. Hoover.	175	325	1.20	4.45	380
April 3.	do.	180	399	1.57	4.70	626
April 27.	do.	192	626	1.01	2.29	636
May 24.	R. J. McGuinness.	195	667	1.25	2.60	831
June 14.	H. S. Kerby.	200	925	2.29	3.64	2,120
June 22.	do.	207	1,373	4.21	5.76	5,776
June 23.	do.	206	1,171	3.48	5.00	4,044
July 5.	A. W. Lowrie.	207	1,189	3.04	4.97	3,607
July 22.	do.	202	917	2.17	3.65	1,991
Aug. 18.	H. S. Kerby.	203	934	2.50	3.98	2,341
Sept. 6.	do.	210	1,216	3.30	5.13	4,012
Sept. 27.	W. K. Broughton.	203	787	1.80	3.22	1,418
Oct. 18.	do.	204	811	1.81	3.21	1,464
Nov. 14.	C. M. O'Neil.	198	797	0.94	3.36	747
Dec. 11.	do.	174	568	0.75	3.56	427

DAILY GAUGE HEIGHT AND DISCHARGE of Clearwater river near Rocky Mountain house, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.	3.99b	321	4.09	291	4.37	302	4.62	575	2.72	939	5.27	4,282
2.	3.88	321	4.11	292	4.32	302	4.76	610	3.58	1,816	4.69	3,355
3.	3.81	313	4.16	293	4.22	301	4.75	626	3.55	1,780	4.34	2,836
4.	3.77	302	4.19	294	4.20	308	4.69	630	3.45	1,660	4.54	3,130
5.	3.79	302	4.17	294	4.15	315	4.63	622	3.22	1,406	4.67	3,325
6.	3.83	306	4.17	294	4.15	323	4.62	612	3.10	1,280	4.37	2,878
7.	3.77	313	4.20	294	4.18	331	4.62	602	3.22	1,406	4.10	2,500
8.	3.70	317	4.22	296	4.18	342	4.76	616	3.12	1,301	4.00	2,360
9.	3.69	315	4.23	297	4.23	351	4.90	643	2.85	1,043	4.03	2,402
10.	3.68	310	4.23	298	4.31	362	4.89	646	2.65	887	4.03	2,402
11.	3.77	303	4.28	298	4.56	372	4.84	647	2.40	716	3.83	2,134
12.	3.86	302	4.28	299	4.51	382	4.73	645	2.35	685	3.70	1,965
13.	3.99	304	4.30	300	4.44	389	4.62	642	2.30	654	3.66	1,915
14.	4.03	310	4.32	301	4.47	388	4.61	641	2.25	625	3.66	1,915
15.	4.02	319	4.34	302	4.34	380	4.61b	1,250	2.25	625	4.29	2,766
16.	4.05	330	4.34	303	4.22	368	3.65	1,902	2.25	625	4.89	3,674
17.	4.03	338	4.37	304	4.22	364	2.84	1,034	2.25	625	5.22	4,202
18.	3.77	342	4.40	304	4.27	362	2.33	673	2.25	625	5.77	5,136
19.	3.95	343	4.41	304	4.30	368	2.18	586	2.30	654	6.19	5,892
20.	3.98	343	4.38	304	4.30	380	2.27	637	2.35	685	7.22	7,818
21.	4.00	325	4.31	305	4.45	399	2.26	631	2.35	685	7.19	7,761
22.	3.83	309	4.43	306	4.58	420	2.25	625	2.35	685	5.19	5,190
23.	3.73	288	4.46	306	4.98	470	2.15	571	2.35	685	5.02	3,882
24.	3.64	259	4.56	306	4.73	495	2.14	566	2.55	815	4.82	3,562
25.	3.99	270	4.51	305	4.56	502	2.13	561	2.78	985	4.70	3,370
26.	4.04	280	4.49	305	4.66	504	2.17	581	2.78	985	4.76	3,466
27.	4.08	284	4.39	304	4.61	503	2.29	648	2.80	1,000	5.20	4,170
28.	4.00	285	4.39	303	4.54	512	2.45	748	3.70	1,965	5.39	4,483
29.	4.01	286	4.37	303	4.44	518	2.45	748	4.08	2,472	5.14	4,074
30.	4.05	288	.....	.....	4.49	527	2.58	836	4.49	3,055	4.99	3,834
31.	4.03	290	.....	.....	4.52	550	.....	.....	5.80	5,190	.....	.....

b Ice conditions, January 1 to April 15.

DAILY GAUGE HEIGHT AND DISCHARGE of Clearwater river near Rocky Mountain house, for 1916
—Concluded

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	4.38	2,892	3.77	2,056	3.81	2,108	3.09	1,270	2.69	917	3.86	616
2....	4.48	3,040	3.74	2,017	3.81	2,108	3.09	1,270	2.69	917	3.86	590
3....	4.69	3,355	4.32	2,808	3.81	2,108	3.04	1,220	2.67	902	3.87	555
4....	5.31	4,347	4.67	3,325	4.71	3,386	3.04	1,220	2.64	880	3.77	530
5....	4.92	3,722	4.47	3,025	5.46	4,602	2.99	1,171	2.65	887	3.67	510
6....	4.57	3,175	4.12	2,528	5.09	3,994	2.99	1,171	2.63	872	3.78	482
7....	4.32	2,808	3.94	2,279	4.66	3,310	2.99	1,171	2.59	843	3.68	450
8....	4.22	2,668	3.84	2,147	4.46	3,010	2.94	1,124	2.45	740	3.59	426
9....	5.17	4,122	3.82	2,121	4.41	2,935	2.91	1,095	2.48	740	3.69	410
10....	5.12	4,042	3.72	1,991	4.21	2,654	2.89	1,077	2.55	790	3.49	420
11....	4.87	3,642	3.70	1,965	4.01	2,374	2.89	1,077	3.12	900	3.53	427
12....	4.74	3,434	3.67	1,928	4.01	2,374	2.89	1,077	2.82	790	3.70	431
13....	4.62	3,250	3.57	1,804	3.96	2,306	2.89	1,077	3.52	764	3.65	433
14....	4.57	3,175	3.42	1,624	3.91	2,238	2.84	1,034	3.33	747	3.76	433
15....	4.40	2,920	3.42	1,624	3.80	2,095	2.84	1,034	3.35	744	3.71	430
16....	4.17	2,598	3.42	1,624	3.75	2,030	2.84	1,034	3.31	735	3.86	425
17....	3.90	2,225	3.67	1,928	3.52	1,744	2.97	1,152	3.41	726	3.72	417
18....	3.74	2,017	3.92	2,252	3.40	1,600	3.10	1,280	3.41	715	3.72	410
19....	4.57	3,175	5.30	4,530	3.38	1,578	3.14	1,322	3.32	704	3.73	404
20....	4.07	2,458	5.67	4,959	3.35	1,545	3.09	1,270	3.22	690	3.63	395
21....	3.77	2,056	4.92	3,722	3.32	1,512	3.09	1,270	3.23	670	3.63	395
22....	3.64	1,890	4.70	3,370	3.30	1,490	3.04	1,220	3.13	654	3.54	393
23....	3.47	1,684	4.51	3,085	3.29	1,480	3.04	1,220	3.13	650	3.44	390
24....	3.54	1,768	4.51	3,085	3.29	1,480	3.04	1,220	3.54	655	3.44	388
25....	3.87	2,186	4.46	3,010	3.24	1,427	3.04	1,220	3.84	665	3.45	385
26....	4.32	2,808	4.26	2,724	3.24	1,427	3.04	1,220	3.85	675	3.15	384
27....	4.57	3,175	4.11	2,514	3.20	1,385	2.99	1,171	3.85	675	3.16	383
28....	4.62	3,250	3.83	2,134	3.19	1,374	2.91	1,095	3.70	665	3.26	381
29....	4.47	3,025	3.76	2,043	3.09	1,270	2.87	1,060	3.71	653	3.26	380
30....	4.27	2,738	3.71	1,978	3.09	1,270	2.79	992	3.76	639	3.27	380
31....	3.97	2,320	3.71	1,978	.....	.....	2.74	954	.....	.....	3.27	386

b Ice conditions, November 8 to December 31.

MONTHLY DISCHARGE of Clearwater river near Rocky Mountain house, for 1916

(Drainage area 1,214 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	343	259	307	0.253	0.29	18,877
February.....	306	291	300	0.247	0.27	17,256
March.....	550	301	399	0.329	0.38	24,534
April.....	1,902	561	712	0.586	0.65	42,367
May.....	5,190	625	1,244	1.025	1.18	76,491
June.....	7,818	1,615	3,689	3.039	3.39	219,511
July.....	4,347	1,334	2,902	2.390	2.76	178,437
August.....	4,959	1,624	2,515	2.072	2.39	134,641
September.....	4,602	1,270	2,140	1.763	1.97	127,340
October.....	1,322	954	1,154	0.951	1.10	70,957
November.....	917	639	753	0.620	0.69	44,807
December.....	616	380	434	0.357	0.41	26,686
The year.....	.....	.....	.....	.....	15.48	1,001,904

SESSIONAL PAPER No. 25a

NORTH SASKATCHEWAN RIVER NEAR ROCKY MOUNTAIN HOUSE

Location.—On the NE. $\frac{1}{4}$ Sec. 21, Tp. 39, Rge. 7, W. 5th Mer., 2,000 feet below the railway bridge and one mile west of Rocky Mountain house.

Records available.—From June 2, 1913, to December 31, 1916.

Gauge.—Inclined staff graduated to feet and tenths. From June 2, 1913, to June 27, 1915, located 1,200 feet above the cable on the left bank. Zero elevation maintained at 3,108.39 feet from June 2, 1913, to October 23, 1913; zero elevation maintained at 3,108.42 feet from October 23, 1913, to June 27, 1915. After June 28, 1915, the gauge was located 20 feet below the cable, on the left bank, and has been maintained at a zero elevation of 3,108.47 feet.

Bench-mark.—On nails in a spruce tree, on the north side of the road allowance, on the left bank of the river and 50 feet from the edge of the bank; elevation 3,126.93 feet. (Department of Public Works of Canada datum.) On October 8, 1915, a permanent iron bench-mark was set on the left bank, 3 feet above the cable tower; elevation 3,125.96 feet. (Department of Public Works of Canada datum.)

Channel.—One channel at all stages.

Discharge measurements.—Made from a cable car.

Winter flow.—Stream affected by ice from November to April and measurements made 1,400 feet above the cable section.

Observers.—Wm. Austin, January 1, to October 31, and H. Gillespie, November 1 to December 31.

Accuracy.—The open water discharge curve passes through five out of nine actual meterings and the other points are all very close to the curve.

Gauge height observations are made to one-hundredth of a foot at the time of mean daily gauge heights. The curve is smooth and results are well within the limit of error.

The winter discharge is computed from gauge height observations, graphs of maximum and minimum temperatures and occasional measurements under ice conditions and is a reasonably fair estimate.

DISCHARGE MEASUREMENTS of North Saskatchewan river near Rocky Mountain house, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 24.....	O. H. Hoover.....	360	860	0.94	5.31	806
Feb. 18.....	S. H. Frame.....	329	910	1.30	6.68	820e
Mar. 11.....	O. H. Hoover.....	331	918	1.42	6.28	1,175
April 1.....	do.....	500	697	2.38	3.02	1,308
April 25.....	do.....	516	1,213	3.44	3.98	1,656
May 24.....	R. J. McGuinness.....	512	1,844	4.05	5.34	4,176
June 13.....	H. S. Kerby.....	510	1,805	4.04	5.29	7,490
June 13.....	do.....	532	3,645	7.42	8.83	7,292x
June 22.....	A. W. Lowrie.....	521	3,302	6.57	8.18	27,046x
June 23.....	do.....	520	3,271	6.54	8.12	21,694x
July 4.....	H. S. Kerby.....	520	3,271	6.54	8.12	21,406x
July 4.....	do.....	513	2,037	4.30	5.73	9,166
July 24.....	do.....	513	2,010	4.38	5.69	8,806
July 24.....	do.....	516	2,269	4.97	6.30	11,281
Aug. 17.....	do.....	520	3,037	5.85	7.60	17,757
Sept. 5.....	do.....	513	1,614	4.13	5.01	6,659
Sept. 26.....	W. K. Broughton.....	510	1,449	3.94	4.76	5,710
Oct. 17.....	do.....	515	1,850	1.68	6.71	3,100e
Nov. 13.....	C. M. O'Neill.....	412	1,449	1.10	5.08	1,579
Dec. 9.....	do.....					

e Discharge estimated from area, gauge height and velocity.

x Slope measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan river near Rocky Mountain house, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	5.306	1,422	5.16	770	5.86	808	6.30	1,308	3.48	2,400	5.63	8,608
2....	5.25	1,405	5.16	780	5.71	818	6.35	1,330	3.95	3,040	5.83	9,360
3....	5.20	1,383	5.21	790	5.61	834	6.45	1,390	4.75	4,820	5.96	9,886
4....	5.16	1,332	5.26	800	5.51	852	6.50	1,444	4.98	5,100	6.48	12,122
5....	5.11	1,306	5.36	800	5.61	868	6.35	1,490	4.88	5,020	6.12	10,556
6....	5.11	1,302	5.41	802	5.60	888	6.30	1,590	4.65	4,680	5.77	9,126
7....	5.16	1,295	5.51	804	5.71	912	6.40	1,600	4.58	4,580	5.54	8,290
8....	5.12	1,287	5.56	810	5.71	950	6.50	1,675	4.32	4,150	5.39	7,777
9....	5.17	1,265	5.51	814	5.81	1,010	6.65	1,760	3.95	3,500	5.45	7,980
10....	5.22	1,220	5.56	810	6.11	1,142	6.85	1,834	3.75	3,280	5.43	7,912
11....	5.17	1,160	5.61	800	6.36	1,175	6.50	1,864	3.57	3,080	5.25	7,315
12....	5.13	1,132	5.61	795	6.51	1,180	6.25	1,861	3.49	3,020	5.05	6,660
13....	5.18	1,110	5.66	795	6.46	1,175	6.10	1,852	3.41	2,960	5.19	7,117
14....	5.23	1,100	5.71	800	6.31	1,160	6.15	1,884	3.41	2,980	5.59	8,465
15....	5.33	1,100	5.76	800	6.16	1,150	6.25	1,918	3.35	2,990	6.84	13,796
16....	5.39	1,102	5.76	805	6.16	1,142	6.25	1,932	3.39	3,040	8.06	20,286
17....	5.44	1,100	6.36	810	6.11	1,140	6.15	1,930	3.43	3,100	8.54	22,998
18....	5.44	1,090	6.60	820	6.06	1,142	4.85 ^a _b	1,890	3.40	3,100	9.69	29,641
19....	5.49	1,040	6.41	828	6.06	1,150	3.55	2,320	3.49	3,250	10.01	31,602
20....	5.40	942	6.16	826	6.11	1,170	3.51	2,264	3.80	3,760	10.94	37,368
21....	5.35	875	6.11	828	6.21	1,190	3.43	2,159	3.81	3,820	10.61	35,322
22....	5.40	840	6.16	833	6.26	1,206	3.41	2,133	3.84	3,900	9.03	25,791
23....	5.35	812	6.31	840	6.21	1,212	3.31	2,021	3.73	3,710	8.15	20,790
24....	5.31	806	6.26	840	6.16	1,220	3.25	1,955	3.98	4,176	7.55	17,510
25....	5.31	775	6.26	830	6.09	1,220	3.15	1,760	4.18	4,442	7.48	17,134
26....	5.16	742	6.16	822	6.06	1,224	3.21	1,850	4.33	4,769	7.50	17,240
27....	5.11	730	6.11	818	6.11	1,234	3.42	2,080	4.76	5,822	8.40	22,200
28....	5.11	720	6.01	804	6.16	1,260	3.51	2,340	5.06	6,692	8.53	22,941
29....	5.16	730	5.96	800	6.46	1,280	3.46	2,300	5.57	8,395	8.30	21,630
30....	5.16 ^a	730	.....	.....	6.41	1,290	3.28	2,140	5.87	9,520	7.75	18,590
31....	5.11	750	.....	.....	6.36	1,300	.....	.....	5.80	9,240	.....	.....

^a Gauge height interpolated.^b Ice conditions from January 1 to April 18.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan river near Rocky Mountain house, for 1916—*Concluded*

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	6.83	13,747	6.37	11,638	6.68	13,038	4.49	5,137	3.94	3,992	5.46	2,260
2....	6.93	14,243	6.57	12,532	6.65	12,900	4.46	5,068	3.88	3,886	5.53	2,200
3....	7.45	16,975	6.97	14,447	6.88	13,992	4.47	5,091	3.80	3,750	5.66	2,090
4....	8.19	21,014	7.40	16,710	7.52	17,348	4.40	4,930	3.74	3,648	5.66	2,020
5....	7.75	18,590	6.92	14,192	7.50	17,240	4.27	4,634	3.77	3,699	5.37	1,920
6....	6.90	14,090	6.65	12,900	7.32	16,286	4.21	4,502	3.73	3,631	5.31	1,840
7....	6.75	13,365	6.34	11,506	6.68	13,038	4.17	4,423	3.64	3,484	5.05	1,750
8....	7.25	15,915	6.54	12,394	6.58	12,578	4.10	4,290	3.62	3,452	4.94	1,660
9....	8.30	21,630	6.76	13,412	6.40	11,770	4.07	4,233	3.57	3,375	5.20	1,579
10....	8.43	22,371	6.89	14,041	6.10	10,470	4.06	4,214	3.52	3,300	5.00	1,550
11....	8.18	20,958	6.36	11,594	5.72	8,936	4.05	4,195	4.76b	3,200	4.80	1,500
12....	8.08	20,398	6.69	13,084	5.42	7,878	4.01	4,119	6.60	3,160	5.00	1,510
13....	8.35	21,915	5.91	9,681	5.40	7,810	3.99	4,082	6.70	3,100	5.20	1,520
14....	8.68	23,796	5.86	9,480	5.25	7,315	3.92	3,956	6.60	3,055	5.25	1,520
15....	7.58	17,672	6.26	11,158	4.97	6,413	4.02	4,138	6.69	3,010	5.40	1,510
16....	6.81	13,649	6.39	11,726	4.75	5,795	4.06	4,214	6.65	2,970	5.49	1,500
17....	7.35	16,445	6.56	11,594	4.77	5,849	4.68	5,008	6.48	2,920	5.49	1,480
18....	8.15	20,790	6.56	12,186	4.62	5,452	5.40	7,810	6.49	2,880	5.49	1,450
19....	7.45	16,975	7.56	17,564	4.87	6,126	5.02	6,564	6.50	2,850	5.99	1,435
20....	6.90	14,090	6.84	13,796	5.02	6,564	4.85	6,070	5.99	2,810	6.29	1,410
21....	7.30	16,180	6.39	11,726	5.07	6,724	4.67	5,582	5.98	2,760	6.49	1,395
22....	6.58	12,578	6.14	10,642	4.90	6,210	4.61	5,426	5.98	2,710	6.79	1,390
23....	5.68	8,788	6.47	12,078	4.92	6,268	4.50	5,160	5.86	2,670	6.56	1,390
24....	5.70	8,860	6.89	14,041	4.85	6,070	4.42	4,976	5.59	2,640	6.53	1,390
25....	6.02	10,134	6.81	13,649	4.92	6,268	4.35	4,815	5.57	2,600	6.46	1,385
26....	6.90	14,090	6.69	13,084	4.87	6,126	4.29	4,678	5.58	2,550	6.53	1,350
27....	7.20	15,650	6.51	12,256	4.85	6,010	4.24	4,568	5.47	2,510	6.08	1,315
28....	7.35	16,445	6.41	11,814	4.62	5,452	4.13	4,347	5.37	2,460	6.18	1,370
29....	7.67	18,158	6.29	11,287	4.57	5,328	4.08	4,252	5.35	2,410	6.03	1,370
30....	6.35	11,550	6.34	11,506	4.44	5,022	4.08	4,252	5.36	2,330	6.07	1,375
31....	6.42	11,858	6.51	12,256	.....	.....	4.00	4,100	.....	.....	6.17b	1,380

b Ice conditions, November 11 to December 31.

MONTHLY DISCHARGE of North Saskatchewan river near Rocky Mountain house, for 1916

(Drainage area 4,162 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	1,422	720	1,052	0.253	0.29	64,685
February.....	840	770	809	0.194	0.21	46,534
March.....	1,300	808	1,107	0.266	0.31	68,067
April.....	2,340	1,308	1,862	0.447	0.50	110,797
May.....	9,520	2,400	4,398	1.057	1.22	270,422
June.....	37,368	6,660	16,534	3.973	4.43	983,841
July.....	23,796	8,788	16,233	3.900	4.50	998,129
August.....	17,564	9,480	12,589	3.025	3.49	774,067
September.....	17,348	5,022	8,878	2.133	2.38	528,278
October.....	7,810	3,956	4,820	1.158	1.33	296,370
November.....	3,992	2,330	3,060	0.735	0.82	182,082
December.....	2,260	1,370	1,578	0.379	0.44	96,966
The year.....	.....	.....	.....	.....	19.92	4,420,238

MEAN MONTHLY DISCHARGE in Second-feet of North Saskatchewan river at Rocky Mountain house

MONTH	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-feet	Mean in Acre-feet
October.....		3,100	3,187	3,086	4,820	3,698	227,397
November.....		1,892	1,753	1,994	3,060	2,175	129,405
December.....		1,630	850	1,364	1,578	1,355	83,329
January.....		848	833	1,052		911	56,015
February.....		729	751	809		763	42,910
March.....		862	681	1,107		883	54,314
April.....		1,114	1,451	1,862		1,476	87,808
May.....		4,104	5,934	4,398		4,812	295,878
June.....	12,347a	10,808	22,894	16,534		16,745	996,389
July.....	13,456	12,914	22,562	16,235		16,291	1,001,717
August.....	13,550	8,916	16,753	12,589		12,952	796,381
September.....	7,417	4,772	6,964	8,878		7,008	416,989
Total in acre-feet.....	2,812,119	3,136,982	5,132,546	4,273,980			4,188,532

a 2-30.

SOUTHESK RIVER

Location.—Tp. 43, Rge. 20, W. 5th Mer., about five miles above mouth of stream, at Forestry ford.

Records available.—Discharge measurements only in 1915.

Gauge.—None established.

Bench-mark.—Standard wooden. Located on the left bank about 50 feet down stream from trail; assumed elevation 100.00 feet.

Channel.—Fairly permanent consisting of sand, gravel and rock.

Discharge measurements.—Made from a temporary cable.

Winter flow.—Stream affected by ice from November to May.

Observer.—None obtainable.

Remarks.—No discharge measurements were obtained in 1916.

BLACKSTONE RIVER NEAR GRASS MOUNTAIN

(Formerly South Branch of Brazeau river)

Location.—Tp. 43, Rge. 16, W. 5th Mer., about one-half mile above the mouth of Chungo creek.

Records available.—Discharge measurements only during open water seasons 1915 and 1916.

Gauge.—None established.

Bench-mark.—Standard wooden, located on the left bank 25 feet below cable; assumed elevation 100.00 feet.

Channel.—Shifting, consisting of sand, gravel and boulders.

Discharge measurements.—Made from a cable or by wading.

Winter flow.—Stream affected by ice from November to May.

Floods.—In 1916 the stream reached its maximum stage about June 16, when the water surface elevation relative to bench-mark was 95.80 feet.

Observer.—None available.

DISCHARGE MEASUREMENTS of Blackstone river (formerly South Brazeau) near Grass Mountain, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		Feet	Sq. ft.	Ft. per sec.	Feet	Sec.-ft.
June 8.....	C. M. O'Neil.....	153	264	3.20	95.19x	845m
Sept. 4.....	do	140	210	2.40	94.79x	503
Sept. 7.....	do	134	183	2.07	94.58x	379

x Water surface elevation referred to bench-mark.

m Discharge measured at miscellaneous section 2,000 feet above regular section.

CHUNGO CREEK

Location.—Tp. 43, Rge. 17, W. 5th Mer., about 300 feet above mouth of creek.

Records available.—Discharge measurements only during 1915 and 1916.

Gauge.—None established.

Bench-mark.—Standard wooden, located on the right bank in line with measuring section and thirty feet from normal water edge; assumed elevation 100.00 feet.

Channel.—Fairly permanent, consisting of sand, gravel and rock.

Discharge measurements.—Made by wading.

Winter flow.—Stream affected by ice from November to May.

Floods.—The stream reached its maximum stage in 1916, about June 16, when the water surface elevation was 88.30 feet relative to bench-mark. There was no flooding of banks.

Observer.—None available.

DISCHARGE MEASUREMENTS of Chungo creek near mouth of creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
June 9.....	C. M. O'Neil.....	45.5	73.0	2.04	87.40 _x	149
Sept. 1.....	do	42.5	53.0	1.68	86.57 _x	89

_x Water surface elevation referred to bench-mark.

BROWN CREEK

Location.—Tp. 44, Rge. 17, W. 5th Mer., about five miles above the mouth of stream and near Forestry ford.

Records available.—Discharge measurements only during open water seasons 1915 and 1916.

Gauge.—None established.

Bench-mark.—Standard wooden, located on the left bank fifty feet below gauging section; assumed elevation 100.00 feet.

Channel.—Fairly permanent, consisting of sand, gravel and rock.

Discharge measurements.—Made by wading.

Winter flow.—Stream affected by ice from November to May.

Floods.—Maximum stage for 1916 was reached during June, the water surface elevation being 89.90 feet. There was no flooding of banks.

Observer.—None available.

DISCHARGE MEASUREMENTS of Brown creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
June 7.....	C. M. O'Neil.....	64.0	83.0	1.70	89.14 _x	141
Sept. 2.....	do	59.5	73.0	1.61	89.39 _x	118

_x Water surface elevation referred to bench-mark.

NORTH SASKATCHEWAN RIVER AT ROCKY RAPIDS

Location.—On the NE. $\frac{1}{4}$ Sec. 10, Tp. 49, Rge. 7, W. 5th Mer.

Records available.—Data supplied by Sir John Jackson (Canada) Company Limited, from June 10, 1913, to May 2, 1914. Records by this office, January 1, 1915, to December 31, 1916.

Gauge.—Vertical staff on left bank; zero elevation maintained at 88.30 feet from November 15, 1915, to December 31, 1916.

Bench-mark.—Permanent iron bench-mark at foot of left bank cable tower; assumed elevation 125.53 feet.

Channel.—One channel at all stages.

Observers.—W. H. Kew, January 1 to August 5; J. L. Combs, October 29 to December 31. Between August 5 and October 29 no observer was available.

Accuracy.—Gauge heights at this station were read to one-hundredth of a foot. None were recorded between August 6 and October 28, 1916, as no observer was available.

Discharge measurements showed shifting conditions during the high water season, during which period the bed of the river filled with gravel and sand to a depth of seven feet in places.

There are two curves used, one previous to, and one after, high water conditions, and during high water from July 7 to August 19, conditions gradually shifted.

Either of the curves pass through all the plotted discharge measurement points with the exception of one during shifting conditions.

From August 6 to October 28, there was no observer and the discharges are estimates based upon the discharges at the station at Edmonton and upon four measurements at the Rocky Rapids station.

The control not being constant this was a difficult station, but the results recorded should be well within the maximum limit of error.

The winter records are based upon discharge measurements, daily gauge heights and temperature records and are a fair estimate of the discharge.

DISCHARGE MEASUREMENTS of North Saskatchewan river at Rocky rapids, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 11.....	R. J. McGuinness.....	420	2,395	0.56	6.35	1,336
Feb. 5.....	do.....	420	2,137	0.59	6.15	1,255
Mar. 7.....	do.....	420	2,008	0.48	6.04	972
Mar. 18.....	do.....	420	2,019	0.62	6.26	1,255
April 30.....	do.....	550	3,242	0.73	4.59	2,367 _x
May 24.....	C. McGavin.....	530	2,923	1.69	4.78	4,957
June 16.....	do.....	598	4,719	4.62	7.92	21,792
July 1.....	do.....	662	6,664	9.53	12.42	63,508 _x
July 7.....	do.....	601	4,552	6.03	8.66	27,477
July 7.....	do.....	601	4,552	6.03	8.66	27,477 _x
July 29.....	do.....	614	4,457	7.12	9.59	31,633
Aug. 10.....	do.....	603	3,965	6.84	8.80	27,108
Sept. 8.....	W. T. Reeve.....	592	3,663	6.16	8.20	22,563
Sept. 30.....	do.....	563	2,047	3.76	5.87	7,705
Oct. 29.....	do.....	546	1,991	3.74	5.71	7,449
Nov. 26.....	do.....	.....	2,046	1.50	3.32	3,070 _e
Dec. 18.....	do.....	308	2,249	1.46	4.48	3,277

e Estimated from area and velocity.

x Slope measurement.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan river at Rocky rapids, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	6.07 ^b	1,390	6.16	1,230	6.19	1,060	6.35	2,950	4.60	4,540	7.95	21,895
2....	6.08	1,380	6.14	1,240	6.11	1,030	6.35	3,050	6.36	11,196	7.25	16,705
3....	6.04	1,370	6.15	1,240	6.07	1,000	6.50	3,100	6.37	11,247	7.05	15,335
4....	6.04	1,370	6.14	1,240	6.05	990	6.60	3,350	6.33	11,043	7.55	18,890
5....	6.03	1,360	6.14	1,250	6.03	980	6.65	3,400	6.13	10,064	7.80	20,750
6....	6.04	1,350	6.15	1,260	6.04	980	6.65	3,580	6.09	9,873	7.35	17,425
7....	6.05	1,340	6.14	1,250	6.06	970	6.60	3,660	5.75	8,335	6.90	14,340
8....	6.19	1,340	6.14	1,250	6.04	1,010	6.53	3,720	5.55	7,495	6.65	12,790
9....	6.24	1,340	6.15	1,250	6.03	1,100	6.60	3,820	5.21	6,234	6.55	12,220
10....	6.30	1,340	6.13	1,250	6.05	1,160	6.76	3,900	4.98	5,542	6.70	13,080
11....	6.33	1,340	6.06	1,250	6.14	1,200	6.80	3,980	4.77	4,962	6.75	13,390
12....	6.31	1,380	6.13	1,250	6.24	1,240	6.70	4,050	4.63	4,612	6.55	12,220
13....	6.33	1,410	6.11	1,260	6.32	1,260	6.36	4,140	4.54	4,402	6.43	11,562
14....	6.27	1,430	6.09	1,270	6.40	1,280	6.16	4,250	4.47	4,247	6.55	12,220
15....	6.28	1,430	6.13	1,280	6.38	1,280	5.76	4,250	4.48	4,268	6.60	12,500
16....	6.29	1,430	6.11	1,290	6.36	1,280	5.76	4,440	4.46	4,226	8.40	25,550
17....	6.27	1,410	6.14	1,290	6.30	1,270	5.76	8,500	4.41	4,121	9.10	31,580
18....	6.26	1,400	6.24	1,300	6.24	1,255	5.76	8,720	4.47	4,247	9.65	36,575
19....	6.25	1,380	6.12	1,300	6.25	1,300	5.76	6,700	4.58	4,494	9.98	39,710
20....	6.24	1,340	6.32	1,300	6.30	1,330	5.76 ^b	4,000	4.73	4,858	10.15	41,325
21....	6.24	1,300	6.15	1,300	6.31	1,370	5.21	6,234	5.00	5,600	11.72	56,600
22....	6.21	1,250	6.13	1,310	6.34	1,440	5.16	6,076	4.95	5,455	10.88	48,260
23....	6.24	1,190	6.30	1,300	6.40	1,510	4.40	4,100	4.84	5,148	9.65	36,575
24....	6.20	1,150	6.33	1,280	6.54	1,640	4.05	3,462	4.87	5,229	9.05	31,140
25....	6.15	1,130	6.31	1,250	6.54	2,000	4.10	3,545	5.15	6,045	8.73	28,341
26....	6.13	1,120	6.27	1,220	6.51	2,380	4.28	3,868	5.56	7,536	8.54	26,716
27....	6.11	1,120	6.27	1,180	6.44	2,550	4.35	4,002	5.75	8,335	8.84	29,298
28....	6.13	1,150	6.25	1,150	6.43	2,900	4.65	4,660	6.20	10,400	9.36	33,890
29....	6.14	1,180	6.23	1,100	6.42	2,950	4.75	4,910	6.55	12,220	9.25	32,905
30....	6.14	1,200	.....	.....	6.40	2,950	4.65	4,660	6.70	13,080	9.08	31,404
31....	6.15	1,210	.....	.....	6.34	2,950	.....	.....	7.15	16,010	.....	.....

^b Ice conditions, January 1 to April 20.

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan river at Rocky rapids, for 1916
—Concluded

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	8.54	26,716	7.90	18,300	.....	17,000	.....	7,500	2.65	6,400e	5.10	2,830
2....	8.86	29,472	7.95	18,950	.....	20,000	.....	7,500	2.63	6,350e	5.16	2,890
3....	7.91	21,587	8.00	19,200	.....	24,000	.....	7,500	2.49	5,900e	5.60	3,190
4....	9.65	36,575	8.90	26,460	.....	30,000	.....	7,000	2.46	5,800e	5.11	3,010
5....	10.24	42,180	8.70	24,940	.....	38,000	.....	7,000	2.43	5,700e	5.24	3,020
6....	9.26	32,994	.....	22,000e	.....	34,000	.....	6,000	2.39	5,600e	5.36	3,120
7....	8.65	27,650	.....	22,000	.....	32,000	.....	6,000	2.25	5,250e	5.56	3,250
8....	8.39	25,301	.....	22,000	8.20	22,563d	.....	5,800	2.04	5,000	3.34	3,000
9....	9.14	31,580	.....	21,000	.....	23,000	.....	6,000	2.10	5,110	3.27	2,680
10....	9.79	37,335	.....	21,000	.....	24,000	.....	6,000	2.24	5,450	3.22	2,640
11....	9.69	36,195	.....	20,000	.....	18,000	.....	6,000	2.60	5,470	3.11	2,670
12....	9.24	31,824	.....	16,000	.....	17,000	.....	5,800	0.62	3,920	3.16	2,710
13....	9.09	29,348	.....	15,000	.....	15,000	.....	5,800	0.36	3,570	3.20	2,800
14....	9.64	35,118	.....	14,000	.....	12,500	.....	5,800	0.80	3,480	4.32	3,000
15....	9.29	31,668	.....	14,000	.....	13,000	.....	5,800	1.51	3,550	4.17	3,120
16....	8.29	23,000	.....	15,000	.....	11,000	.....	5,700	1.81	4,060	4.59	3,200
17....	8.00	20,600	.....	16,000	.....	11,000	.....	6,000	1.83	4,100	4.56	3,270
18....	8.69	24,065	.....	17,000	.....	10,000	.....	7,000	2.01	4,100	5.04	3,277
19....	9.09	28,211	8.80	27,108d	.....	10,000	.....	10,000	2.42	4,110	4.52	3,230
20....	8.39	23,162	.....	27,000	.....	9,000	.....	11,000	4.04	4,190	4.68	2,930
21....	7.79	18,374	.....	23,000	.....	9,000	.....	11,000	6.40a	4,320	4.92	2,400
22....	7.47	15,942	.....	20,000	.....	8,500	.....	11,000	6.87	4,300	5.32	2,030
23....	7.14	13,638	.....	17,000	.....	8,500	.....	9,000	7.36	4,190	5.27	2,090
24....	6.94	12,332	.....	21,800	.....	8,500	.....	8,500	7.06	3,960	5.29	2,210
25....	6.74	11,094	.....	23,000	.....	8,500	.....	8,000	6.13	3,740	5.31	2,390
26....	7.39	14,802	.....	22,500	.....	8,500	.....	8,000	4.00	3,070	6.01	2,370
27....	9.19	27,515	.....	22,000	.....	8,500	.....	8,000	6.12	3,700	5.55	2,050
28....	9.58	31,756	.....	20,000	.....	8,000	.....	7,500e	5.68	3,540	5.35	1,940
29....	9.30	28,124	.....	18,000	.....	7,800	2.93	7,419	5.73	3,470	5.45	2,010
30....	8.60	23,600	.....	18,000	5.87	7,705d	2.77	6,800e	5.86	3,520	5.34	2,400
31....	8.10	19,800	.....	17,000	.....	.....	2.72	6,600e	.....	.....	5.37	2,500

a Gauge height interpolated.

d Actual measurement.

e Discharge estimated. Between August 6 and October 28, estimates are based on the discharge at Edmonton. No observer was available at this station.

MONTHLY DISCHARGE of North Saskatchewan river at Rocky rapids, for 1916

(Drainage area 8,149 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	1,430	1,120	1,307	0.160	0.18	80,364
February.....	1,310	1,100	1,253	0.154	0.17	72,073
March.....	2,950	970	1,536	0.188	0.22	94,445
April.....	8,720	2,950	4,436	0.544	0.61	263,960
May.....	16,010	4,121	7,260	0.891	1.03	446,400
June.....	56,600	11,562	25,173	3.089	3.45	1,497,897
July.....	42,180	11,094	26,208	3.216	3.71	1,611,467
August.....	27,108	14,000	19,076	2.451	2.83	1,228,276
September.....	38,000	7,705	15,819	1.941	2.17	941,296
October.....	11,000	5,700	7,324	0.899	1.04	450,335
November.....	6,400	3,070	4,497	0.552	0.62	267,590
December.....	3,277	1,940	2,717	0.333	0.38	167,062
The year.....	.....	.....	.....	.....	16.41	7,121,165

SESSIONAL PAPER No. 25B

LAKE WABAMUN AT WABAMUN

Location.—On the NE. $\frac{1}{4}$ Sec. 2, Tp. 53, Rge. 4, W. 5th Mer., at a landing stage in the town of Wabamun.

Records available.—Gauge heights obtained every alternate day from November 10, 1915, to November 26, 1915, and from April 20, 1916, to November 4, 1916.

Gauge.—Vertical metallic staff attached to pile at landing stage; elevation of zero maintained at 93.42 feet.

Bench-mark.—Top of post on jetty marked "B.M."; assumed elevation 97.42 feet. Auxiliary bench-mark; platform of Grand Trunk Pacific railway station at southeast corner of station building; assumed elevation 103.30 feet.

Winter records.—No winter records are being obtained.

Observer.—A. Broadhurst.

DAILY GAUGE HEIGHT, IN FEET, of Lake Wabamun at Wabamun P.O., Province of Alberta, for 1915-1916

DAY	Aug. 1915	Oct. 1915	Nov. 1915	April 1916	May 1916	June 1916	July 1916	Aug. 1916	Sept. 1916	Oct. 1916	Nov. 1916
1		1.64				1.46	1.40		1.68	1.55	
2					1.43			1.78			1.47
3						1.49	1.50		1.72	1.51	
4					1.45		1.87	1.78			1.47 ^b
5						1.45	1.65		1.75	1.54	
6					1.43			1.78			
7					1.59	1.43	1.69		1.76	1.53	
8					1.44			1.78			
9	2.29					1.43	1.75		1.75	1.53	
10			1.45		1.43			1.74			
11						1.51	1.75		1.74	1.52	
12			1.45		1.42			1.69			
13						1.47	1.85		1.73	1.50	
14			1.44		1.44			1.69			
15						1.44	1.86		1.73	1.51	
16			1.43		1.45			1.70			
17						1.44	1.84		1.72	1.55	
18			1.425		1.47			1.68			
19						1.34	1.79		1.69	1.56	
20		1.54	1.45	1.35	1.51			1.70			
21						1.42	1.76		1.65	1.54	
22			1.425	1.34	1.47			1.71			
23						1.33	1.70		1.64	1.51	
24			1.425	1.34	1.48			1.70			
25						1.34	1.67		1.63	1.51	
26			1.45 ^a	1.35	1.50			1.69			
27						1.34	1.80		1.61	1.54	
28				1.35	1.48			1.66			
29						1.37	1.80		1.59	1.57	
30				1.40	1.48			1.64			
31							1.70			1.48	

^a Lake frozen over; ice 9 inches thick at gauge.

^b Observations for 1916 ceased.

NORTH SASKATCHEWAN RIVER AT EDMONTON

Location.—On river lot No. 17, NW. $\frac{1}{4}$ Sec. 33, Tp. 52, Rge. 24, W. 4th Mer., at the low level traffic and railway bridge in the city of Edmonton.

Records available.—May 1, 1911, to December 31, 1916.

Gauge.—Chain gauge on bridge; elevation of zero maintained at 1,991.09 feet from June 28, 1915, to December 31, 1916.

Staff gauge used as a winter gauge on wharf five hundred feet below station; elevation of zero maintained at 1,991.09 feet during the winters of 1915-16 and 1916-17.

Former gauges.—Previous to June 28, 1915, there were two vertical staff gauges.

One low level, reading 0 to 10 feet.

Elevation of zero maintained at 1,991.73 feet during 1911.

Elevation of zero maintained at 1,991.09 feet during 1912, 1913, 1914 and up to June 28, 1915.

One high level, reading 10 to 34 feet.

Elevation of zero maintained at 1,995.67 feet during 1911-12.

Elevation of zero maintained at 1,991.09 feet during 1913, 1914 and up to June 28, 1915.

Bench-mark.—Permanent iron bench-mark on the right bank, ten feet down stream from bridge abutment; elevation 2,037.33 feet (Department of Public Works of Canada datum).

Channel.—One, slightly shifting at all stages.

Discharge measurements.—Made from bridge.

Observer.—J. W. Weir.

Accuracy.—Daily gauge heights are read to one-hundredth of a foot at the same hour daily, from the low level bridge at Edmonton during the open water season by means of a chain gauge, and during winter conditions from a staff gauge on the wharf below the bridge.

The daily discharges are computed from an open water discharge curve in summer. The discharge curve passes through eight out of ten actual metering points and close to the two remaining points, one on each side of the curve.

The curve is smooth and well defined and results are well within the limit of error.

In winter the discharges are computed from actual measurements every three weeks, from gauge heights recorded daily, and from maximum and minimum temperature graphs, and are reasonably fair estimates.

DISCHARGE MEASUREMENTS of North Saskatchewan river at Edmonton, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 13.....	C. M. O'Neil.....	328	2,063	0.66	9.45	1,354
Feb. 17.....	do.....	320	1,880	0.63	9.38	1,183
Mar. 11.....	do.....	320	1,933	0.64	9.17	1,238
April 8.....	do.....	340	2,840	1.48	11.20	4,200
April 27.....	do.....	439	2,724	1.45	9.15	3,953
May 11.....	H. S. Kerby.....	483	3,291	2.06	10.41	6,780
June 1.....	do.....	564	5,263	3.21	14.35	17,914
June 17.....	do.....	582	6,395	3.83	16.43	24,365 ^x
June 17.....	do.....	578	6,370	3.81	16.01	24,273
June 22.....	do.....	609	10,959	5.61	23.89	61,500 ^x
June 28.....	do.....	587	6,989	4.20	17.14	29,398
July 15.....	do.....	592	7,773	4.49	18.42	34,860
July 28.....	do.....	593	7,333	4.36	17.68	31,863
Aug. 22.....	do.....	579	6,398	3.52	15.84	22,512
Oct. 10.....	W. T. Reeve.....	518	3,166	2.00	10.70	6,361
Nov. 3.....	do.....	441	2,980	1.87	10.38	5,559
Nov. 23.....	C. McGavin.....	462	3,332	1.08	10.51	3,596
Dec. 21.....	do.....	454	2,687	0.82	10.42	2,217

^x Slope measurement.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan river at Edmonton, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	9.005	1,300	9.36	1,150	9.61	1,000	10.84	3,290	9.94	4,950	15.00	20,200
2....	8.90	1,280	9.36	1,170	9.51	980	10.90	3,370	9.74	4,656	15.79	23,379
3....	8.80	1,280	9.35	1,170	9.40	970	10.62	3,560	11.67	8,542	14.71	19,040
4....	8.84	1,280	9.35	1,180	9.30	950	10.52	3,720	12.83	11,985	14.23	17,120
5....	8.78	1,330	9.34	1,170	9.29	960	10.69	3,860	12.07	9,636	14.77	19,280
6....	8.72	1,320	9.34	1,160	9.19	970	10.89	3,980	12.06	9,608	15.23	21,120
7....	8.66	1,270	9.43	1,160	9.08	1,020	11.01	4,100	12.10	9,720	15.13	20,720
8....	8.70	1,260	9.43	1,160	9.08	1,070	11.08	4,200	12.09	9,692	13.76	15,312
9....	8.84	1,250	9.42	1,160	9.17	1,130	11.17	4,180	12.13	9,804	13.24	13,424
10....	8.90	1,260	9.42	1,160	9.17	1,190	10.99	4,220	12.28	10,232	13.73	15,201
11....	9.14	1,275	9.41	1,160	9.16	1,238	11.32	4,260	10.41	5,718	13.66	14,942
12....	9.28	1,325	9.41	1,160	9.18	1,300	11.32	4,300	9.61	4,474	13.71	15,127
13....	9.35	1,354	9.40	1,160	9.36	1,370	11.42	4,320	9.45	4,275	13.52	14,432
14....	9.45	1,400	9.40	1,160	9.37	1,450	11.85	4,700	9.31	4,121	13.63	14,831
15....	9.45	1,390	9.39	1,170	9.52	1,550	10.00	5,040	9.26	4,066	13.29	13,004
16....	9.44	1,380	9.39	1,170	9.62	1,640	9.95	4,965	9.17	3,970	13.86	15,682
17....	9.34	1,370	9.38	1,183	9.62	1,670	10.12	5,232	9.19	3,990	15.89	23,799
18....	9.43	1,350	9.38	1,185	9.59	1,680	12.60	11,200	9.20	4,000	18.55	35,665
19....	9.43	1,320	9.37	1,190	9.75	1,880	13.00	12,580	9.21	4,011	18.76	36,652
20....	9.42	1,270	9.47	1,190	9.63	1,940	11.006	6,920	9.21	4,011	19.27	39,096
21....	9.42	1,200	9.56	1,190	9.48	1,900	9.20	4,000	9.47	4,297	21.39	49,272
22....	9.41	1,140	9.56	1,190	9.54	1,910	9.11	3,910	9.80	4,740	23.32	58,800
23....	9.41	1,080	9.75	1,180	9.64	1,970	9.22	4,022	10.15	5,280	19.90	42,120
24....	9.40	1,060	9.65	1,180	9.80	2,120	9.17	3,970	10.12	5,232	17.79	32,195
25....	9.40	1,040	9.64	1,170	9.83	2,270	9.17	3,970	9.82	4,770	16.95	28,415
26....	9.39	1,030	9.64	1,140	10.03	2,500	9.12	3,920	10.45	5,790	16.61	26,904
27....	9.39	1,030	9.73	1,080	10.23	2,930	9.15	3,950	11.55	8,235	16.13	24,799
28....	9.38	1,050	9.63	1,040	10.53	3,130	9.27	4,077	11.67	8,542	17.16	29,360
29....	9.38	1,070	9.62	1,030	10.63	3,270	9.70	4,600	12.45	10,740	18.34	31,684
30....	9.37	1,100	.....	.....	10.63	3,320	9.90	4,890	12.99	12,545	17.87	32,555
31....	9.37	1,120	.....	.....	10.67	3,290	.....	.....	13.17	13,175	.....	.....

b Ice conditions, January 1 to April 20.

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan river at Edmonton, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	17.54	31,070	16.00	24,240	14.35	17,647	11.44	7,960	10.84	6,552	9.65	2,690
2....	15.92	23,912	14.99	20,160	14.26	17,210	11.29	7,596	10.50	5,889	10.00	2,775
3....	15.81	23,461	14.94	19,960	15.16a	20,340	11.26	7,524	10.38	5,666	10.25	2,855
4....	18.13	33,725	16.44	26,155	18.06	24,495	11.23	7,452	10.35	5,615	10.25	2,920
5....	21.40	49,320	16.30	25,510	17.49	30,845	11.09	7,127	10.30	5,830	10.09	2,940
6....	19.80	41,640	16.20	25,100	19.15	38,520	10.95	6,805	10.25	5,445	10.12	2,620
7....	18.94	37,512	15.57	22,480	18.20	34,040	10.65	6,160	10.22	5,394	9.95	2,840
8....	18.99	37,752	15.46	22,040	17.82	32,330	10.55	5,970	10.21	5,513	9.74	2,450
9....	19.04	37,992	15.51	22,240	16.11	24,713	10.53	5,934	10.30	5,530	9.80	2,430
10....	17.94	32,870	15.43	21,920	16.08	24,554	10.71	6,250	10.29	5,513	9.90	2,450
11....	17.54	31,070	15.34	21,560	16.02	24,325	10.63	6,120	9.60	3,750	9.95	2,560
12....	17.95	32,915	15.12	20,610	14.58	19,520	10.55	5,910	9.59	3,740	9.97	2,650
13....	17.97	33,005	14.02	16,280	14.32	17,410	10.47	5,826	9.60	3,710	9.97	2,700
14....	18.15	33,815	13.79	15,423	13.82	15,534	10.46	5,808	9.53	3,690	10.05	2,760
15....	18.41	35,007	13.52	14,432	13.10	12,930	10.45	5,790	9.98	3,840	10.10	2,825
16....	16.99	28,595	13.57	14,612	13.16	13,140	10.44	5,772	10.38	3,845	10.10	2,900
17....	15.63	22,723	13.83	15,571	12.72	11,605	10.59	6,042	10.50	3,810	10.20	2,940
18....	16.19	25,057	14.03	16,320	12.55	11,045	11.07	7,081	10.51	3,776	10.20	2,930
19....	16.74	27,476	14.23	17,120	12.27	10,203	12.21	10,029	10.54	3,730	10.20	2,860
20....	17.04	28,820	17.63	31,475	12.16	9,838	12.67	11,438	10.52	3,680	10.32	2,250
21....	15.97	24,117	16.23	25,232	12.09	9,692	12.68	11,472	10.51	3,650	10.42	2,217
22....	15.98	24,158	15.75	23,215	12.04	9,552	12.63	11,302	10.51	3,620	10.41	2,230
23....	15.67	22,887	15.10	20,600	11.80	8,890	11.80	8,890	10.52	3,596	10.41	2,440
24....	13.97	16,089	14.77	19,280	11.76	8,782	11.68	8,568	10.52	3,550	10.29	2,510
25....	13.37	13,892	15.41	21,840	11.76	8,782	11.52	8,160	10.47	3,525	9.98	2,510
26....	13.14	13,070	15.71	23,051	11.78	8,836	11.47	8,035	10.45	3,500	9.98	2,420
27....	16.60	26,860	15.65	22,805	11.80	8,890	11.34	7,836	10.45	3,455	9.68	2,100
28....	18.28	34,408	15.45	22,000	11.62	8,412	11.25	7,530	10.46	3,420	9.59	2,040
29....	18.40	34,960	15.06	20,440	11.47	8,035	11.23	7,452	10.50	3,355	9.57	2,300
30....	16.03	24,369	14.55	18,490	11.44	7,960	11.19	7,357	9.50	2,610	9.57	2,350
31....	15.98	24,158	14.40	17,800	.....	.....	11.17	7,311	.....	.....	9.43b	2,350

a Gauge height interpolated.

b Ice conditions November 11 to December 31.

MONTHLY DISCHARGE of North Saskatchewan river at Edmonton, for 1916

(Drainage area 10,495 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	1,400	1,030	1,232	0.117	0.13	75,753
February.....	1,190	1,030	1,158	0.110	0.12	66,609
March.....	3,320	950	1,760	0.168	0.19	108,220
April.....	12,580	3,290	4,777	0.455	0.51	284,251
May.....	13,175	3,970	6,929	0.660	0.76	426,048
June.....	58,800	13,424	25,591	2.438	2.72	1,522,770
July.....	49,320	13,070	29,249	2.787	3.21	1,798,450
August.....	26,156	14,432	20,902	1.992	2.30	1,255,214
September.....	38,520	7,960	16,592	1.581	1.76	987,292
October.....	11,472	5,772	7,592	0.715	0.82	461,290
November.....	6,552	2,610	4,293	0.409	0.48	255,451
December.....	2,940	2,040	2,585	0.246	0.28	158,945
The year.....	.....	.....	.....	.....	13.26	7,430,283

SESSIONAL PAPER No. 25B

MEAN MONTHLY DISCHARGE IN Second-feet of North Saskatchewan river at Edmonton

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-feet	Mean in Acre-feet
October.....		6,597	7,162	4,539	4,558	5,673	7,502	6,005	369,242
November.....		3,723 ^a	3,177	2,357	2,473	3,013	4,293	3,063	182,238
December.....		1,635 ^b	1,680	1,053	1,102	1,716	2,585	1,624	100,115
January.....		1,255	1,393	1,213	1,223	1,232		1,233	77,670
February.....		1,328	1,313	952	1,079	1,153		1,165	65,742
March.....		1,316	1,315	1,134	1,677	1,760		1,440	88,567
April.....		4,629	8,227	2,983	3,323	4,777		4,788	284,894
May.....	9,238	11,926	9,727	9,064	8,373	6,929		9,210	566,268
June.....	17,412	18,242	19,780	24,618	39,272	25,591		24,153	1,437,179
July.....	28,094	34,158	21,439	18,889	42,661	29,249		29,082	1,788,159
August.....	24,600	26,444	18,505	11,099	23,554	20,902		20,851	1,282,060
September.....	11,502	12,864	9,430	6,492	10,294	16,592		11,196	666,192
Total in Acre-feet	5,528,580	7,536,081	6,253,951	5,111,452	8,466,730	7,188,222			6,908,326

^a 1-10.^b 6-31.

STURGEON RIVER AT ST. ALBERT

Location.—Between river lots 27 and 52, St. Albert settlement, Alberta, at the highway bridge, crossing the Sturgeon river in the village of St. Albert.

Records available.—April 23, 1913, to November 6, 1916.

Gauge.—Vertical staff, fastened to sheet piling on the left bank of the river near the upstream face of the left abutment. Zero elevation maintained at 90.23 feet since establishment.

Bench-mark.—On the cement sill of the east basement window of the St. Albert hotel and marked "B.M., D.I." and a broad arrow in white paint; assumed elevation 100.00 feet.

Channel.—One channel at all stages, fairly permanent.

Control.—Vegetation in bed of stream causes a change of control during the summer.

Discharge measurements.—Made from bridge.

Winter flow.—Stream affected by ice from November to April. Measurements are discontinued during the winter.

Observer.—Lawrence Farrel.

DISCHARGE MEASUREMENTS of Sturgeon river at St. Albert, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 11.....	C. M. O'Neil.....	85	373	0.74	4.90	277
May 10.....	H. S. Kerby.....	85	216	0.95	2.16	205
June 2.....	do.....	85	176	0.79	1.80	139
June 26.....	do.....	70	115	0.48	1.02	56
July 15.....	do.....	84	181	0.45	1.65	82
July 29.....	do.....	85	210	0.48	2.10	93
Aug. 28.....	do.....	85	242	0.22	2.49	53
Sept. 15.....	do.....	85	307	0.33	3.28	102
Oct. 11.....	W. T. Reeve.....	85	282	0.38	2.99	108
Nov. 2.....	do.....	85	258	0.38	2.73	98

DAILY GAUGE HEIGHT AND DISCHARGE of Sturgeon river at St. Albert, for 1916

Day	April		May		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			2.90	312	1.74	137	1.09	57
2.....			2.70	278	1.76	140	1.07	54
3.....			2.60	261	1.70	132	1.17	61
4.....			2.50	244	1.68	130	1.28	69
5.....			2.43	234	1.64	125	1.37	75
6.....			2.35	222	1.58	118	1.27	64
7.....	4.61 ^b	280 ^c	2.30	215	1.56	116	1.27	64
8.....	4.71	300	2.28	212	1.55	114	1.28	61
9.....	4.76	320	2.20	201	1.45	104	1.37	67
10.....	4.83	360	3.15	194	1.55	114	1.40	68
11.....	4.90	380	2.12	190	1.53	112	1.46	72
12.....	4.89	400	2.05	180	1.52	111	1.48	72
13.....	4.84	420	2.00	173	1.56	116	1.51	72
14.....	4.73	450	1.98	170	1.56	116	1.61	79
15.....	4.41 ^b	500 ^c	1.96	167	1.58	118	1.63	82
16.....	4.06	547	1.94	165	1.52	111	1.62	76
17.....	3.91	505	1.90	159	1.55	114	1.76	89
18.....	3.81	485	1.86	153	1.42	100	1.81	91
19.....	3.71	465	1.82	148	1.17	73	1.88	97
20.....	3.56	435	1.81	146	1.11	68	1.86	92
21.....	3.53	429	1.86	153	1.16	72	1.88	92
22.....	3.49	421	1.83	149	1.16	72	1.89	90
23.....	3.42	408	1.78	142	1.10	67	1.98	98
24.....	3.32	389	1.75	138	1.10	67	1.97	90
25.....	3.26	377	1.78	142	1.07	64	1.97	90
26.....	3.16	358	1.77	141	1.02	60	1.97	87
27.....	3.06	340	1.76	140	0.99 ^x	56	2.00	88
28.....	3.16	358	1.71	133	0.98	53	2.07	94
29.....	3.26	377	1.68	130	0.93	46	2.10	94
30.....	3.16	358	1.71	133	1.02	53	2.11	92
31.....			1.72	135			2.12	90

^b Ice conditions from April 7 to April 15.^c Discharge estimated.^x Gauge height affected by weeds, causing shifting conditions from June 27 to end of season.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Sturgeon river at St. Albert, for 1916—*Concluded*

Day	August		September		October		November	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	2.16	91	2.50	50	3.18	119	2.76	101
2.....	2.22	96	49	48	3.15	117	2.73	98
3.....	2.28	99	2.51	47	3.12	116	2.69	94
4.....	2.33	101	2.65	60	3.12	117	2.68	92
5.....	2.36	101	2.75	68	3.13	119	2.67	91
6.....	2.38	100	2.72	64	3.15	122	2.66x	89
7.....	2.40	99	2.74	64	3.07	114	.....	.....
8.....	2.42	98	2.73	62	3.05	113	.....	.....
9.....	2.42	95	2.89	76	3.02	111	.....	.....
10.....	2.48	98	2.93	78	3.02	112	.....	.....
11.....	2.48	96	3.00	84	2.97	108	.....	.....
12.....	2.43	88	3.03	85	2.98	110	.....	.....
13.....	2.44	86	3.09	90	2.97	109	.....	.....
14.....	2.47	87	3.16	92	2.97	110	.....	.....
15.....	2.47	84	3.22	102	2.93	107	.....	.....
16.....	2.48	82	3.28	99	2.94	109	.....	.....
17.....	2.48	79	3.31	112	2.89	105	.....	.....
18.....	2.47	75	3.36	121	2.89	106	.....	.....
19.....	2.54	79	3.37	125	2.89	106	.....	.....
20.....	2.55	77	3.41	131	2.88	106	.....	.....
21.....	2.54	75	3.38	128	2.91	109	.....	.....
22.....	2.53	71	3.36	127	2.89	108	.....	.....
23.....	2.52	68	3.34	127	2.87	107	.....	.....
24.....	2.53	66	3.33	127	2.88	109	.....	.....
25.....	2.53	63	3.32	127	2.84	105	.....	.....
26.....	2.52	60	3.31	127	2.88	108	.....	.....
27.....	2.51	53	3.34	132	2.85	107	.....	.....
28.....	2.51	53	3.31	130	2.81	104	.....	.....
29.....	2.49	51	3.24	124	2.79	102	.....	.....
30.....	2.49	51	3.24	125	2.77	101	.....	.....
31.....	2.51	52	.....	.....	2.77	102	.....	.....

x Observations discontinued November 6.

MONTHLY DISCHARGE of Sturgeon river at St. Albert, for 1916

(Drainage area 992 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April (7-30).....	547	280	402	0.405	0.36	19,137
May.....	312	130	179	0.180	0.21	11,006
June.....	140	46	96	0.097	0.11	5,712
July.....	98	54	80	0.081	0.09	4,919
August.....	101	51	80	0.081	0.09	4,919
September.....	132	47	98	0.099	0.11	5,831
October.....	122	101	109	0.110	0.13	6,702
November (1-6).....	101	89	94	0.095	0.02	1,118
The year.....	.....	.....	.....	.....	1.12	59,344

STURGEON RIVER NEAR FORT SASKATCHEWAN

Location.—On the NW. $\frac{1}{4}$ Sec. 28, Tp. 55, Rge. 22, W. 4th Mer., at the steel traffic bridge about five miles north of Fort Saskatchewan and one and one-half miles from the mouth of the river.

Records available.—January 1, 1914, to December 31, 1916. Discharge measurements only in 1913.

Gauges.—Vertical staff fastened to a pile on the left bank of the river. Chain gauge installed on August 20, 1915, on the centre of the bridge, downstream side. Zero elevation of both gauges maintained at 87.52 feet since establishment.

Bench-mark.—Marked with white paint on top of the downstream side of the left abutment; assumed elevation 100.00 feet. Auxiliary bench-mark on downstream side of left wing wall marked "B.M., D.I." and a broad arrow in white paint.

Elevation 96.00 feet referred to assumed bench-mark.

Channel.—One permanent channel at all stages.

Discharge measurements.—Made from bridge.

Winter flow.—Stream affected by ice from November to April.

Observer.—A. McDougall.

DISCHARGE MEASUREMENTS of Sturgeon river near Fort Saskatchewan, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft</i>
Jan. 17.....	C. M. O'Neil.....	40	65	0.93	5.28	60
Feb. 15.....	do.....	40	64	0.84	5.45	54
Mar. 4.....	do.....	45	65	0.97	5.63	63
Mar. 31.....	do.....	63	93	1.02	6.37	95
May 9.....	H. S. Kerby.....	72	171	1.42	3.34	243
June 5.....	do.....	67	147	0.94	3.16	138
July 8.....	do.....	61	131	0.51	2.85	74
July 31.....	do.....	67	143	0.63	2.99	90
Aug. 30.....	do.....	61	129	0.50	2.85	64
Sept. 16.....	do.....	64	139	0.73	2.93	102
Oct. 9.....	W. T. Reeve.....	68	146	0.83	3.06	121
Nov. 10.....	do.....	71	157	0.45	3.26	71
Dec. 6.....	C. McGavin.....	63	118	0.38	3.57	43
Dec. 27.....	do.....	42	62	0.29	3.90	18

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Sturgeon river near Fort Saskatchewan, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	4.80b	66	5.40	53	5.40	61	6.30	103	3.54	270	3.00	99
2....	4.90	66	5.40	53	5.40	61	6.50	113	3.54	270	3.10	123
3....	4.80	65	5.30	51	5.40	62	6.50	126	3.53	266	3.10	123
4....	4.80	64	5.10	47	5.40	63	6.20	147	3.53	266	3.10	123
5....	4.80	63	5.00	47	5.60	63	6.10	170	3.42	225	3.05	111
6....	4.80	63	5.10	50	5.70	63	6.00	200	3.42	225	3.05	111
7....	4.80	62	5.20	52	5.90	63	6.00	250	3.36	204	3.00	99
8....	4.70	61	5.30	53	5.90	64	6.00	310	3.41	222	3.00	99
9....	4.99	61	5.40	53	5.90	66	6.00	350	3.30	184	3.01	101
10....	4.99	60	5.40	53	6.00	68	5.90	350	3.30	184	3.01	101
11....	4.99	58	5.40	53	6.30	74	5.90	360	3.30	184	3.01	101
12....	4.99	58	5.40	54	6.20	73	5.90	410	3.40	218	3.01	101
13....	4.99	59	5.50	54	6.20	73	6.00	440	3.40	218	3.02	104
14....	5.09	59	5.50	54	6.20	72	6.10	460	3.20	152	3.02	104
15....	5.09	59	5.50	54	6.20	72	6.30	470	3.25	168	3.02	104
16....	5.08	60	5.40	54	6.00	72	6.80	500	3.30	184	3.02	104
17....	5.30	60	5.40	55	6.00	72	7.10	530	3.25	168	2.93	84
18....	5.20	61	5.50	55	6.00	72	7.15	600	3.20	152	2.93	84
19....	5.20	61	5.50	55	6.00	72	7.20	550	3.20	152	2.93	84
20....	5.20	61	5.50	56	6.00	72	4.20b	550	3.10	123	2.83	67
21....	5.20	60	5.50	56	6.00	72	4.10	504	3.10	123	2.84	68
22....	5.20	58	5.50	57	6.00	72	4.09	499	3.15	138	2.74	55
23....	5.20	54	5.50	57	6.00	72	4.09	499	3.20	152	2.74	55
24....	5.30	54	5.50	58	6.00	75	3.98	449	3.10	123	2.74	55
25....	5.30	54	5.40	58	6.00	77	3.88	406	3.10	123	2.74	55
26....	5.30	54	5.40	58	6.00	80	3.77	360	3.10	123	2.75	56
27....	5.30	53	5.40	59	6.00	83	3.67	320	3.10	123	2.75	56
28....	5.40	53	5.40	59	6.00	86	3.66	316	3.10	123	2.75	56
29....	5.40	53	5.40	60	6.00	89	3.66	316	3.10	123	2.75	56
30....	5.40	53	.....	.....	6.10	92	3.65	312	3.10	123	2.75	56
31....	5.40	53	.....	.....	6.30	95	.....	.....	3.00	99	.....	.....

b-b Ice conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Sturgeon river near Fort Saskatchewan, for 1916
—Concluded

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	2.76	57	2.93	84	2.80	62	3.07	116	3.16	140	3.47	45
2....	2.76	57	2.93	84	2.80	62	3.07	116	3.16	140	3.57	45
3....	2.76	57	2.93	84	2.88	75	3.07	116	3.26	171	3.57	44
4....	2.86	72	2.93	84	3.00	99	3.07	116	3.16	140	3.57	43
5....	2.87	73	2.93	84	3.00	99	3.07	116	3.16	140	3.57	43
6....	2.87	73	2.93	84	3.00	99	3.07	116	3.06	113	3.57	43
7....	2.87	73	2.93	84	2.95	88	3.07	116	3.06	113	3.57	42
8....	2.87	73	2.93	84	2.94	86	3.07	116	3.16 ^b	98	3.67	41
9....	2.88	75	2.93	84	2.94	86	3.06	113	3.25	85	3.67	38
10....	2.88	75	2.93	84	2.90	78	3.06	113	3.26	71	3.67	36
11....	2.88	75	2.92	82	2.89	76	3.06	113	3.26	61	3.67	31
12....	2.88	75	2.92	82	2.89	76	3.05	113	3.56	56	3.77	26
13....	2.89	76	2.92	82	2.89	76	3.06	113	3.56	56	3.77	26
14....	2.89	76	2.92	82	2.89	76	3.06	113	3.46	58	3.77	29
15....	2.89	76	2.92	82	2.89	76	3.06	113	3.36	60	3.72	31
16....	2.89	76	2.92	82	2.89	76	3.06	113	3.26	60	3.77	31
17....	2.90	78	2.92	82	2.99	97	3.06	113	3.26	60	3.67	31
18....	2.90	78	2.92	82	3.04	109	3.03	113	3.26	59	3.67	29
19....	2.90	78	2.92	82	3.09	121	3.03	113	3.26	58	3.57	27
20....	2.90	78	2.92	82	3.08	118	3.03	113	3.26	57	3.57	23
21....	2.91	80	2.91	80	3.08	118	3.06	113	3.36	56	3.57	21
22....	3.01	101	2.91	80	3.08	118	3.06	113	3.36	54	3.77	19
23....	3.01	101	2.91	80	3.08	118	3.06	113	3.36	53	3.77	19
24....	3.01	101	2.91	80	3.08	118	3.06	113	3.46	51	3.77	18
25....	3.01	101	2.91	80	3.08	118	3.06	113	3.46	50	3.97	18
26....	3.02	104	2.91	80	3.08	118	3.06	113	3.46	49	3.97	18
27....	3.02	104	2.81	64	3.08	118	3.06	113	3.46	48	3.98	18
28....	3.02	104	2.81	64	3.08	118	3.03	113	3.46	47	3.83	19
29....	3.02	104	2.81	64	3.08	118	3.06	113	3.46	47	3.93	21
30....	3.02	104	2.81	64	3.08	118	3.16	140	3.46	46	3.98	22
31....	3.03	106	2.81	64	.....	.....	3.26	171	.....	.....	4.08 ^b	23

b Ice conditions, November 8 to December 31.

MONTHLY DISCHARGE of Sturgeon river near Fort Saskatchewan, for 1916

(Drainage area 1,314 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	66	53	59	0.045	0.05	3,628
February.....	60	47	54	0.041	0.05	3,106
March.....	95	61	73	0.056	0.06	4,489
April.....	600	103	366	0.279	0.31	21,779
May.....	270	99	174	0.132	0.15	10,699
June.....	104	55	86	0.065	0.07	5,117
July.....	106	57	83	0.063	0.07	5,103
August.....	84	64	79	0.060	0.07	4,858
September.....	121	62	97	0.074	0.08	5,772
October.....	171	113	117	0.090	0.10	7,194
November.....	171	46	77	0.059	0.07	4,582
December.....	45	18	30	0.023	0.03	1,845
The year.....	.....	.....	.....	.....	1.11	78,172

SESSIONAL PAPER No. 25a

HASTINGS CREEK NEAR TOFIELD

Location.—On SE. $\frac{1}{4}$ Sec. 23, Tp. 51, Rge. 20, W. 4th Mer.

Records available.—From February 14, 1916, to November 11, 1916. Discharge measurements only were made to April 27, 1916, and were made six miles down stream from the established station. Gauge readings were taken daily after April 27, 1916, and records computed.

Gauge.—Vertical staff; zero elevation 87.83 feet.

Bench-mark.—Pile on right bank; assumed elevation 100.00 feet.

Channel.—Permanent; obstructed during summer months by growth of weeds which affects the velocity.

Discharge measurements.—Made by wading.

Winter flow.—Measurements were made in February, March and April, 1916.

Observer.—Miss Alice Wozencroft.

DISCHARGE MEASUREMENTS of Hastings creek near Tofield, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Feb. 14.....	C. M. O'Neil.....	5.1	2.46	0.25	.....	0.61 _x
Mar. 3.....	do.....	8.1	3.70	0.59	.....	2.20 _x
Mar. 30.....	do.....	7.5	5.98	0.56	.....	3.30 _x
April 10.....	do.....	16.0	23.45	0.89	.....	21.00 _x
April 28.....	do.....	8.6	11.33	1.85	5.00	21.00
June 3.....	H. S. Kerby.....	19.0	20.59	0.99	4.96	20.00
June 27.....	do.....	15.0	25.00	0.96	5.27	24.00
July 17.....	do.....	15.0	13.05	0.62	5.62	8.20
Aug. 1.....	do.....	16.0	15.80	0.47	5.57	7.40
Aug. 29.....	do.....	15.0	14.50	0.44	5.32	6.30
Nov. 9.....	W. T. Reeve.....	18.0	16.80	0.66	4.77	11.00

_x Discharge measured on NE. $\frac{1}{4}$ Sec. 14, Tp. 51, Rge. 19, W. 4th Mer.

DAILY GAUGE HEIGHT AND DISCHARGE of Hastings creek near Tofield, for 1916

Day	April		May		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			5.02	22.0	5.02	22.0	5.46	24.0
2.....			5.02	22.0	5.00	21.0	5.49	24.0
3.....			5.04	22.0	4.95 ^s	21.0	5.52	23.0
4.....			5.05	22.0	5.00	21.0	5.54	25.0
5.....			5.02	22.0	5.02	22.0	5.56	21.0
6.....			5.02	22.0	5.00	21.0	5.62	21.0
7.....			5.12	24.0	4.98	20.0	5.58	19.1
8.....			4.92	19.2	5.01	21.0	5.57	17.6
9.....			4.90	18.7	5.04	21.0	5.56	16.2
10.....			4.92	19.2	5.01	20.0	5.62	16.2
11.....			4.92	19.2	5.01	20.0	5.63	15.3
12.....			4.92	19.2	5.07	22.0	5.63	14.0
13.....			4.92	19.2	5.12	23.0	5.64	13.0
14.....			4.92	19.2	5.04	21.0	5.72	13.3
15.....			4.92	19.2	5.04	20.0	5.64	10.6
16.....			4.90	18.7	5.03	20.0	5.63	9.4
17.....			4.90	18.7	5.04	20.0	5.62	8.2
18.....			4.88	18.3	5.05	20.0	5.72	9.8
19.....			4.87	18.3	5.04	19.9	5.63	8.3
20.....			4.92	19.2	5.05	19.9	5.63	8.3
21.....			4.90	18.7	5.04	19.5	5.62	8.2
22.....			4.92	19.2	5.15	22.0	5.60	7.9
23.....			4.94	19.7	5.15	22.0	5.62	8.1
24.....			4.95	19.9	5.16	22.0	5.60	7.9
25.....			4.95	19.9	5.18	22.0	5.59	7.7
26.....			4.95	19.9	5.23	23.0	5.62	8.1
27.....			4.95	19.9	5.25	24.0	5.63	8.3
28.....	5.00	21.0	4.96	20.0	5.35	25.0	5.54	7.0
29.....	5.00	21.0	4.96	20.0	5.36	24.0	5.54	7.0
30.....	5.01	21.0	4.95	19.9	5.45	25.0	5.52	6.7
31.....			4.99	21.0	.....	.....	5.52	6.7

^s Shifting conditions, caused by weeds, June 3 to Nov. 11.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Hastings creek near Tofield, for 1916—*Concluded*

Day	August		September		October		November	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	5.59	7.7	5.24	5.7	4.97	7.1	4.65	7.8
2.....	5.61	8.0	5.23	5.6	4.97	7.3	4.62	7.5
3.....	5.67	9.1	5.23	5.6	4.97	7.4	4.61	7.5
4.....	5.68	9.3	5.41	8.6	4.97	7.5	4.57	7.2
5.....	5.70	9.8	5.38	8.4	4.95	7.5	4.57	7.3
6.....	5.69	9.7	5.33	7.9	4.95	7.5	4.49	6.3
7.....	5.65	9.2	5.31	7.8	4.92	7.4	4.57	7.6
8.....	5.61	8.7	5.29	7.6	4.85	6.6	4.60	7.9
9.....	5.58	8.3	5.34	8.5	4.85	6.7	4.67	9.0
10.....	5.55	7.9	5.29	7.8	4.85	6.8	4.77	11.0
11.....	5.55	8.0	5.27	7.8	4.84	6.9	4.79 ^s	11.5
12.....	5.52	7.7	5.27	7.9	4.85	7.0	.....	.....
13.....	5.49	7.3	5.25	8.0	4.85	7.5	.....	.....
14.....	5.47	7.1	5.22	7.7	4.82	7.2	.....	.....
15.....	5.47	7.2	5.21	7.8	4.83	7.5	.....	.....
16.....	5.50	7.7	5.20	7.8	4.81	7.5	.....	.....
17.....	5.49	7.7	5.20	7.9	4.81	7.6	.....	.....
18.....	5.50	7.9	5.21	8.3	4.77	7.4	.....	.....
19.....	5.53	8.5	5.21	8.4	4.75	7.0	.....	.....
20.....	5.55	8.9	5.20	8.4	4.81	8.2	.....	.....
21.....	5.46	7.6	5.17	8.6	4.83	8.8	.....	.....
22.....	5.40	6.8	5.15	8.5	4.72	7.1	.....	.....
23.....	5.41	7.1	5.14	8.4	4.72	7.3	.....	.....
24.....	5.41	7.2	5.13	8.2	4.72	7.5	.....	.....
25.....	5.41	7.3	5.11	8.2	4.72	7.7	.....	.....
26.....	5.38	6.9	5.11	8.2	4.72	7.9	.....	.....
27.....	5.41	7.4	5.07	7.0	4.70	7.7	.....	.....
28.....	5.41	7.5	5.05	7.9	4.67	7.5	.....	.....
29.....	5.31	6.2	5.05	8.0	4.67	7.7	.....	.....
30.....	5.28	6.0	5.06	8.2	4.65	7.5	.....	.....
31.....	5.29	6.0	.....	.....	4.65	7.6	.....	.....

^s Shifting conditions caused by weeds, June 3 to Nov. 11.

MONTHLY DISCHARGE of Hastings creek near Tofield, for 1916

(Drainage area 122 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April (28-30).....	21.0	21.0	21.0	0.173	0.02	125
May.....	24.0	18.3	20.0	0.164	0.19	1,230
June.....	25.0	19.5	21.0	0.172	0.19	1,250
July.....	25.0	6.7	12.9	0.106	0.12	793
August.....	9.8	6.0	7.8	0.064	0.07	480
September.....	8.6	5.6	7.8	0.064	0.07	464
October.....	8.8	6.6	7.4	0.061	0.07	455
November (1-11).....	11.5	6.3	8.3	0.068	0.03	181
The period.....	.....	.....	.....	.....	0.76	4,978

NORTH SASKATCHEWAN RIVER AT BATTLEFORD

Location.—North channel, SW. $\frac{1}{4}$ Sec. 33, Tp. 43, Rge. 16, W. 3rd Mer. South channel, NE. $\frac{1}{4}$ Sec. 29, Tp. 43, Rge. 16, W. 3rd Mer.

Records available.—May 16, 1911, to December 31, 1916.

Gauges.—North channel:

Chain; elevation of zero maintained at 1512.30 feet since establishment.

South channel:

Chain; elevation of zero maintained at 1,511.88 feet since establishment.

Bench-mark.—North channel:

On downstream side of left abutment; elevation 1,525.66 feet above mean sea-level (Department of Public Works, Canada).

South channel:

Permanent iron bench-mark on right bank; elevation 1,530.72 feet above mean sea-level (Department of Public Works, Canada).

Channel.—Shifts considerably at high stages.

Discharge measurements.—With current-meter from bridge.

Observers.—H. W. Fisher and W. Bulbick.

DISCHARGE MEASUREMENTS of North channel of North Saskatchewan river at Battleford, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 19-20	F. R. Shenstone	290	1,116	0.28	2.66	314
Feb. 21-22	do	286	1,102	0.31	3.43	345
Mar. 22-23	do	286	1,156	0.33	3.85	380
May 3-4	do	616	1,451	2.01	2.93	2,922
May 29	do	661	2,169	1.58	3.19	3,433
June 19-20	do	1,158	4,366	2.05	5.54	8,963
Sept. 25-26	do	1,068	3,689	1.96	4.88	7,240
Oct. 19-20	do	1,016	2,534	1.70	3.79	4,309
Dec. 8	do	344	1,724	0.84	3.33	1,450
Dec. 27-28	do	343	1,626	0.64	3.82	1,443

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of North channel of North Saskatchewan river
at Battleford, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	2.64 ^a	510	2.89	300	3.56	390	4.04	460	3.11	3,216	4.12	5,168
2....	2.65	500	2.89	310	3.56	390	4.06	470	3.02	3,072	4.36	5,744
3....	2.65	490	2.91	310	3.56	390	4.04	490	.....	3,088	4.89	7,152
4....	2.65	470	2.91	300	3.59	400	4.04	500	3.04	3,104	5.31	8,369
5....	2.65	460	2.94	310	3.60	400	4.04	510	3.30	3,540	6.11	10,730
6....	2.65	450	2.94	300	3.60	400	4.07	520	3.32	3,576	6.79	12,829
7....	.....	430	2.94	290	3.59	390	4.07	540	3.39	3,702	6.24	11,124
8....	.....	420	2.94	280	3.61	390	4.09	560	4.59	6,314	5.93	10,190
9....	.....	410	2.96	280	3.61	380	4.19	580	5.28	8,282	6.34	11,434
10....	.....	400	2.99	280	3.62	380	4.39	600	5.28	8,282	6.52	11,992
11....	.....	390	2.99	260	3.65	390	4.84	700	4.98	7,414	6.20	11,000
12....	.....	380	3.04	270	3.65	380	4.79	1,000	4.66	6,508	5.97	10,310
13....	.....	370	3.14	280	3.65	380	4.91	1,000	4.45	5,960	5.73	9,590
14....	.....	360	3.29	310	3.65	380	5.24	1,300	4.10	5,120	5.60	9,210
15....	.....	350	3.44	380	.....	360	4.83	1,400	3.78	4,440	5.65	9,355
16....	.....	340	3.44	380	.....	370	4.64	1,500	3.53	3,954	5.91	10,130
17....	.....	340	3.44	370	3.65	370	4.79	1,600	3.25	3,450	5.81	9,830
18....	2.67	330	3.44	370	3.65	380	4.99	1,800	3.03	3,088	5.55	9,065
19....	2.66	320	3.41	360	3.65	380	4.69	1,800	2.93	2,928	5.51	8,949
20....	2.66	310	3.41	350	3.65	370	4.17 ^a	1,700	2.85	2,800	5.84	9,920
21....	2.67	310	3.44	350	3.65	380	4.29	5,576	2.77	2,678	7.74	15,811
22....	2.67	300	3.44	340	3.79	380	4.44	5,936	2.72	2,608	8.49	18,222
23....	2.68	280	3.39	320	3.92	380	4.52	6,132	2.68	2,552	9.22	20,595
24....	2.67	280	3.44	350	3.97	390	5.79	9,770	2.71	2,594	10.26	23,975
25....	2.69	280	3.46	300	4.00	400	4.63	6,424	2.68	2,552	10.74	25,535
26....	2.69	280	3.49	370	3.99	420	4.24	5,456	2.78	2,692	9.89	22,772
27....	2.70	280	3.51	370	4.02	430	4.09	5,098	2.89	2,864	8.49	18,222
28....	2.69	260	3.51	380	4.04	440	4.89	7,152	3.13	3,248	7.79	15,968
29....	2.74	280	3.54	390	4.04	440	4.79	6,872	3.18	3,328	7.59	15,338
30....	2.79	280	.....	.....	4.04	450	3.69	4,260	3.14	3,264	7.51	15,086
31....	2.79	280	.....	.....	4.04	450	.....	.....	3.38	3,684	.....	.....

^a Ice conditions January 1 to April 20, discharge from winter graph.

DAILY GAUGE HEIGHT AND DISCHARGE of North channel of North Saskatchewan river
at Battleford, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	7.39	14,708	8.52	18,320	6.42	11,682	4.66	6,508	4.20	5,360	3.74	1,570
2....	8.39	17,898	8.27	17,508	6.29	11,279	4.64	6,452	4.19	5,336	3.62	1,550
3....	8.38	17,865	7.61	15,402	6.15	10,850	4.61	6,368	4.06	5,032	3.60	1,520
4....	8.24	17,410	7.08	13,732	6.18	10,940	4.46	5,984	4.03	4,966	3.53	1,510
5....	7.64	15,496	6.69	12,519	6.19	10,970	4.35	5,720	3.91	4,702	3.33	1,490
6....	7.24	14,236	6.53	12,023	6.32	11,372	4.26	5,504	3.79	4,460	3.24	1,480
7....	7.34	14,551	6.47	11,837	6.65	12,395	4.25	5,480	3.64	4,160	3.24	1,460
8....	9.08	20,140	6.78	12,798	7.41	14,772	4.24	5,456	3.59	4,062	3.24	1,450
9....	9.88	22,740	7.40	14,740	8.91	19,588	4.17	5,288	3.41	3,738	3.24	1,440
10....	8.65	18,742	7.05	13,638	8.71	18,938	4.08	5,076	3.44	3,792	.....	1,430
11....	8.05	16,792	6.70	12,550	8.18	17,215	4.04	4,988	3.49	3,882	.....	1,420
12....	7.64	15,491	6.50	11,930	7.66	15,559	3.93	4,746	3.59	3,200	.....	1,420
13....	8.33	17,702	6.32	11,372	7.28	14,362	3.88	4,640	3.73	3,000	.....	1,415
14....	8.80	19,230	6.39	11,589	7.30	14,425	3.98	4,856	3.72	2,880	.....	1,410
15....	8.91	19,588	6.65	12,395	7.05	13,638	3.89	4,660	3.59	2,880	.....	1,410
16....	8.30	17,605	6.42	11,682	6.65	12,395	3.85	4,580	3.58	2,870	.....	1,405
17....	8.10	16,955	5.94	10,220	6.20	11,000	3.77	4,420	3.28	2,760	3.19	1,405
18....	8.34	17,735	5.95	10,250	5.99	10,370	3.80	4,480	3.29	2,600	3.23	1,400
19....	8.20	17,280	.....	9,950 ^e	5.83	9,890	3.78	4,440	3.20	2,380	3.22	1,400
20....	7.35	14,582	5.75	9,650	5.61	9,239	3.72	4,320	3.36	2,220	3.20	1,400
21....	6.90	13,170	5.96	10,280	5.39	8,601	3.73	4,340	3.37	2,100	3.21	1,400
22....	7.12	13,858	6.23	11,093	5.23	8,137	4.14	5,216	3.16	2,000	3.20	1,400
23....	7.83	16,094	6.41	11,651	5.14	7,876	4.49	6,056	3.16	1,920	3.19	1,400
24....	7.54	15,181	8.10	16,955	5.01	7,499	4.63	6,424	3.24	1,860	3.29	1,405
25....	6.80	12,860	7.56	15,244	4.96	7,348	4.90	7,180	3.35 ^b	1,770	3.37	1,410
26....	6.50	11,930	7.00	13,480	4.84	7,012	4.68	6,564	3.59	1,740	3.46	1,420
27....	6.19	10,970	6.59	12,209	4.83	6,984	4.53	6,158	-3.94	1,700	3.80	1,430
28....	5.93	10,190	6.42	11,682	4.73	6,704	4.51	6,106	4.00	1,660	3.85	1,443
29....	5.70	9,500	6.74	12,674	4.65	6,480	4.43	5,912	3.87	1,620	3.94	1,460
30....	6.22	11,062	6.71	12,581	4.59	6,314	4.33	5,672	3.87	1,600	4.08	1,470
31....	7.38	14,677	6.64	12,364	.....	.....	4.27	5,528	.....	.....	4.09 ^b	1,480

^e Discharge estimated.

^b Ice conditions November 25 to December 31, discharge from winter graph.

MONTHLY DISCHARGE of North channel of North Saskatchewan river at Battleford, for 1916

MONTH	DISCHARGE IN SECOND-FEET			RUN-OFF
	Maximum	Minimum	Mean	
January.....	510	260	359	22,074
February.....	390	260	328	18,867
March.....	450	360	395	24,288
April.....	9,770	460	2,723	161,991
May.....	8,282	2,552	3,997	245,708
June.....	25,535	5,168	12,787	760,699
July.....	22,740	9,500	15,685	964,204
August.....	18,320	9,650	12,720	781,936
September.....	19,588	6,314	11,128	662,005
October.....	7,180	4,320	5,456	335,397

SESSIONAL PAPER No. 25b

DISCHARGE MEASUREMENTS of South channel of North Saskatchewan river at Battleford, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 20-21.....	F. R. Shenstone.....	172	670	1.27	3.98 ^b	850
Feb. 23-24.....	do.....	169	597	1.32	4.49 ^b	790
Mar. 23-24.....	do.....	169	551	1.80	4.94 ^b	992
May 4-5.....	do.....	297	1,239	2.80	4.11	3,468
May 30.....	do.....	314	1,393	2.38	4.23	3,325
June 20.....	do.....	545	2,854	2.64	6.77	7,531
Sept. 26.....	do.....	346	2,858	2.00	6.04	5,713
Oct. 20-21.....	do.....	288	2,303	1.58	4.92	3,630
Dec. 9.....	do.....	188	1,164	1.14	4.55 ^b	1,328
Dec. 27-28.....	do.....	184	1,090	1.06	5.16 ^b	1,151

^b Ice conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of South channel of North Saskatchewan river at Battleford, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	4.13 ^b	1,050	4.15	830	4.55	820	4.85	1,160	4.24	3,388	5.07	3,850
2.....	4.13	1,050	4.20	840	4.55	830	4.80	1,160	4.10	3,360	5.40	4,280
3.....	4.10	1,040	4.20	830	4.54	830	4.78	1,180	.....	3,357 ^c	5.91	5,284
4.....	4.10	1,040	4.25	840	4.57	840	4.76	1,200	4.05	3,355	6.40	6,540
5.....	4.10	1,020	4.25	830	4.56	840	4.75	1,220	4.25	3,390	7.14	8,660
6.....	4.10	1,010	4.27	830	4.58	840	4.75	1,250	4.35	3,410	7.80	10,700
7.....	.....	1,000	4.27	820	4.58	840	4.48	1,270	4.42	3,428	7.19	8,810
8.....	.....	990	4.30	820	4.59	840	4.80	1,280	5.50	4,440	6.93	8,030
9.....	.....	980	4.30	820	4.64	860	4.80	1,300	6.25	6,150	7.26	9,020
10.....	.....	970	4.32	820	4.67	870	4.80	1,300	6.20	6,020	7.56	9,932
11.....	.....	960	4.32	810	4.69	880	4.80	1,500	5.90	5,260	7.20	8,840
12.....	.....	950	4.35	820	4.70	880	5.75	1,700	5.61	4,660	6.93	8,030
13.....	.....	940	4.40	830	4.69	880	6.46	1,800	5.41	4,296	6.79	7,632
14.....	.....	920	4.45	840	4.69	880	6.23	2,000	5.10	3,880	6.64	7,212
15.....	.....	920	4.45	830	.....	880	6.06	2,300	4.93	3,724	6.64	7,212
16.....	.....	900	4.47	830	.....	880	6.10	2,600	4.65	3,530	6.79	7,632
17.....	.....	890	4.45	820	4.70	880	5.80	2,800	4.46	3,444	6.85	7,800
18.....	3.94	860	4.45	810	4.70	880	5.00	3,200	4.30	3,400	6.54	6,932
19.....	3.97	860	4.43	800	4.70	880	4.90	3,600	4.17	3,374	6.64	7,212
20.....	3.98	850	4.50	810	4.72	880	5.50 ^b	3,800	4.12	3,364	6.83	7,744
21.....	3.98	850	4.55	820	4.72	890	5.28	4,112	4.07	3,357	8.75	14,050
22.....	3.98	840	4.51	800	4.74	900	5.32	4,168	4.01	3,351	9.45	16,800
23.....	3.98	840	4.50	790	4.90	960	5.40	4,280	3.96	3,346	10.08	19,320
24.....	4.00	830	4.50	790	4.98	1,020	6.80	7,660	3.96	3,346	11.11	23,440
25.....	4.00	830	4.49	800	5.03	1,050	5.66	4,760	3.95	3,345	11.86	26,440
26.....	4.00	820	4.51	800	5.05	1,080	5.07	3,850	3.99	3,349	10.64	21,560
27.....	4.05	820	4.51	800	4.98	1,110	4.95	3,740	4.00	3,350	9.28	16,120
28.....	4.05	820	4.54	810	4.90	1,120	5.60	4,640	4.25	3,390	8.74	14,012
29.....	4.15	850	4.54	820	4.90	1,140	5.54	4,520	4.35	3,410	8.48	13,048
30.....	4.12	840	.....	.....	4.88	1,140	4.70	3,560	4.33	3,406	8.39	12,724
31.....	4.10	820	.....	.....	4.85	1,150	.....	.....	4.52	3,468	.....	.....

^b Ice conditions January 1 to April 20: discharge from winter graph.^c Discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of South channel of North Saskatchewan river at Battleford, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	8.29	12,364	9.51	17,040	7.52	9,804	5.80	5,040	5.32	4,168	4.90	1,450
2....	9.18	15,720	9.31	16,240	7.38	9,380	5.77	4,980	5.32	4,168	4.76	1,440
3....	9.14	15,560	8.72	13,936	7.24	8,960	5.74	4,920	5.21	4,014	4.76	1,420
4....	8.86	14,068	8.18	11,992	7.26	9,020	5.60	4,640	5.17	3,964	4.70	1,410
5....	8.54	13,264	7.79	10,668	7.28	9,080	5.49	4,424	5.07	3,850	4.50	1,390
6....	8.41	12,796	7.64	10,188	7.43	9,530	5.39	4,266	4.93	3,724	4.43	1,370
7....	8.38	12,688	7.59	10,028	7.76	10,572	5.38	4,252	4.77	3,602	4.55	1,350
8....	9.92	18,080	7.88	10,972	8.51	13,156	5.36	4,224	4.77	3,602	4.40	1,340
9....	10.65	21,600	8.59	13,444	9.79	18,160	5.30	4,140	4.75	3,590	4.55	1,328
10....	9.56	17,240	8.15	11,890	9.79	18,160	5.21	4,014	4.65	3,530	4.54	1,300
11....	9.07	15,280	7.91	11,074	9.26	16,040	5.17	3,964	.....g	3,543	4.55	1,290
12....	8.69	13,822	7.79	10,668	8.76	14,088	5.07	3,850	.....g	3,400	4.56	1,280
13....	9.36	16,440	7.44	9,560	8.37	12,652	5.02	3,800	.....g	3,000	4.32	1,270
14....	9.94	18,760	7.47	9,650	8.38	12,688	5.13	3,916	.....g	2,600	4.16	1,255
15....	10.04	19,160	7.76	10,572	8.14	11,856	5.10	3,880	.....g	2,590	4.17	1,250
16....	9.29	16,160	7.54	9,868	7.74	10,508	4.96	3,748	4.78	2,580	4.19	1,240
17....	9.11	15,440	7.03	8,330	7.30	9,140	4.90	3,700	4.60	2,570	4.10	1,230
18....	9.48	16,920	7.05	8,390	7.08	8,480	4.98	3,764	4.60	2,560	4.11	1,220
19....	9.29	16,160	.....	8,053e	6.91	7,970	4.95	3,740	4.59	2,440	4.19	1,210
20....	8.51	13,156	6.82	7,716	6.70	7,380	4.93	3,724	4.78	2,300	4.30	1,200
21....	7.99	11,346	7.11	8,570	6.50	6,820	4.92	3,716	4.77	2,080	4.37	1,195
22....	8.30	12,400	7.35	9,290	6.34	6,384	5.30	4,140	4.35	1,900	4.36	1,185
23....	8.85	14,430	7.51	9,772	6.23	6,098	5.67	4,780	4.40	1,800	4.32	1,180
24....	8.55	13,300	9.20	15,500	6.11	5,786	5.80	5,040	4.60	1,700	4.40	1,170
25....	7.98	11,312	8.64	13,632	6.05	5,630	6.10	5,760	4.84	1,625	4.50	1,165
26....	7.57	9,964	8.10	11,720	6.04	5,604	5.84	5,128	4.90	1,600	4.57	1,160
27....	7.25	8,990	7.70	10,380	5.96	5,404	5.70	4,840	4.91	1,560	4.90	1,150
28....	6.99	8,210	7.53	9,836	5.87	5,194	5.67	4,780	5.02	1,530	5.15	1,151
29....	6.83	7,744	7.84	10,836	5.77	4,980	5.57	4,580	5.14	1,500	5.23	1,145
30....	7.29	9,110	7.81	10,734	5.72	4,880	5.46	4,376	5.15b	1,480	5.27	1,140
31....	8.44	12,904	7.75	10,540	.....	.....	5.40	4,280	.....	.....	5.37b	1,140

b Ice conditions November 30 to December 31.

c Discharge estimated.

g Blocked with slush ice November 11 to November 15.

MONTHLY DISCHARGE of South channel of North Saskatchewan river at Battleford, for 1916

MONTH	DISCHARGE IN SECOND-FEET			RUN-OFF
	Maximum	Minimum	Mean	
January.....	1,050	820	915	56,261
February.....	840	790	818	47,052
March.....	1,150	820	928	57,060
April.....	7,660	1,160	2,764	164,489
May.....	6,150	3,345	3,753	230,763
June.....	26,440	3,850	10,962	652,289
July.....	21,600	7,744	14,051	863,962
August.....	17,044	7,716	11,013	677,163
September.....	18,160	4,880	9,447	562,136
October.....	5,760	3,716	4,336	266,611

SESSIONAL PAPER No. 25B

MONTHLY DISCHARGE of North Saskatchewan river at Battleford, for 1916

(Drainage area 27,100 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January	1,560	1,080	1,274	0.047	0.05	78,335
February	1,210	1,070	1,146	0.042	0.04	65,919
March	1,600	1,210	1,323	0.049	0.06	81,348
April	17,430	1,620	5,487	0.202	0.22	326,460
May	14,432	5,897	7,750	0.286	0.33	476,471
June	51,975	9,015	23,749	0.877	0.98	1,412,988
July	44,340	17,214	29,736	1.100	1.27	1,828,166
August	35,360	17,366	23,733	0.876	1.01	1,459,099
September	37,748	11,194	20,575	0.759	0.85	1,224,141
October	12,940	8,044	9,792	0.361	0.42	602,008
November	9,528	3,080	5,828	0.211	0.24	346,730
December	3,020	2,540	2,701	0.100	0.12	166,079
The year					5.59	8,067,744

The drainage area given in this table is only approximate. It must be remembered that the greater part of the run-off at this station is derived from the eastern slope of the Rocky mountains and must not be used to base estimates of run-off on other streams in the same territory.

MEAN MONTHLY DISCHARGE in Second-feet of North Saskatchewan river at Battleford

MONTH	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		8,100	6,432	6,942		9,792	7,816	480,599
November		3,874	3,706	4,199		5,828	4,402	261,909
December		1,944	2,161	1,718	1,850	2,701	2,075	127,575
January	1,284	1,220	1,193	1,677	1,274		1,330	81,753
February	1,400	1,553	1,132	1,467	1,146		1,340	75,407
March	1,448	1,963	1,299	1,742	1,323		1,555	95,614
April	8,405	9,621	3,456	7,477	5,487		6,889	409,940
May	11,900	9,664	12,180	5,035 ^a	7,750		10,376	637,966
June	16,738	19,941	31,046		23,749		22,868	1,360,052
July	33,851	23,104	25,907		29,736		28,150	1,730,780
August	27,019	21,631	13,675		23,733		21,514	1,322,840
September	17,381	11,874	8,589		20,575		14,605	869,008
Total in acre-feet.	7,253,353	6,940,546	6,709,631	1,618,879	7,096,680			7,453,443

^a 1-10

No discharge estimates made between May 10 and December 1, 1915, owing to rapidly shifting conditions in channels, and the fact that measurements were not secured frequently enough to follow changes which it is believed occurred owing to unusually high stages.

PIGEON CREEK NEAR WESTEROSE

Location.—On the SE. $\frac{1}{4}$ Sec. 15, Tp. 46, Rge. 28, W. 4th Mer., at the traffic bridge near outlet of Pigeon lake and on the trail from Wetaskiwin to Westerose post office.

Records available.—Discharge measurements only made during 1912, 1913 and 1914. Gauge readings every three days, March 24, 1915, to October 31, 1915, and from March 22, 1916, to October 31, 1916, and records computed for those periods.

Gauge.—Vertical staff, spiked to a post in creek on downstream side of bridge. Zero elevation maintained at 93.36 feet.

Bench-mark.—Permanent iron bench-mark at southwest corner of bridge; assumed elevation 100.23 feet.

Channel.—Permanent; sand and gravel.

Discharge measurements.—Made by wading near the bridge.

Winter flow.—No records taken during the winter.

Observer.—L. I. Wood takes readings at intervals of two or three days. All intermediate readings are interpolated from the observed readings, which were discontinued on October 31, 1916.

DISCHARGE MEASUREMENTS of Pigeon creek near Westeros, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 18.....	O. H. Hoover.....	30	43.20	1.90	4.36	82.0
May 12.....	C. M. O'Neil.....	38	60.15	1.63	4.43	98.0
June 7.....	H. S. Kerby.....	47	74.25	1.29	4.66	96.0
July 19.....	do.....	48	93.90	1.29	5.00	120.0
Aug. 9.....	do.....	19	9.05	1.16	2.87	9.2x
Sept. 17.....	do.....	18	6.65	0.88	2.75	5.8x

x Dam at outlet of lake closed.

DAILY GAUGE HEIGHT AND DISCHARGE of Pigeon creek near Westeros, for 1916

Day	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			2.39	1.12	4.15a	67	4.62a	95
2.....			2.38a	1.04	4.20a	70	4.65	97
3.....			2.36a	0.88	4.26a	74	4.65a	97
4.....			2.35	0.80	4.32a	77	4.65a	97
5.....			2.35a	0.80	4.38	81	4.65a	97
6.....			2.35	0.80	4.36a	80	4.65a	97
7.....			4.15x	67.00	4.34a	78	4.65	97
8.....			3.89a	52.00	4.32a	77	4.73a	102
9.....			3.64a	40.00	4.30	76	4.81a	107
10.....			3.38a	27.00	4.33a	78	4.89	112
11.....			3.12	17.10	4.37a	80	4.88a	111
12.....			3.57a	36.00	4.40	82	4.87a	111
13.....			3.95	56.00	4.41	83	4.87a	111
14.....			4.13a	66.00	4.41a	83	4.86	110
15.....			4.32	77.00	4.40a	82	4.83a	108
16.....			4.33a	78.00	4.40a	82	4.79a	105
17.....			4.35a	79.00	4.40	82	4.76	104
18.....			4.36	80.00	4.39a	81	4.75a	103
19.....			4.36	80.00	4.37	80	4.73	102
20.....			4.35a	79.00	4.40a	82	4.71a	101
21.....			4.33a	78.00	4.43a	84	4.69a	99
22.....	2.37	0.96	4.32	77.00	4.46a	86	4.67a	98
23.....	2.37a	0.96	4.30	76.00	4.49a	87	4.65	97
24.....	2.38a	1.04	4.20a	70.00	4.52	89	4.63a	96
25.....	2.39	1.12	4.10a	64.00	4.55a	91	4.60	94
26.....	2.39a	1.12	4.01a	59.00	4.57a	92	4.59a	93
27.....	2.39a	1.12	3.92	54.00	4.60	94	4.58	93
28.....	2.40a	1.20	3.98a	57.00	4.58a	93	4.58a	93
29.....	2.40	1.20	4.03a	60.00	4.56	92	4.58a	93
30.....	2.40a	1.20	4.09a	63.00	4.58a	93	4.58a	93
31.....	2.39a	1.12			4.60a	94		

a Gauge height interpolated.

x Sluice-way opened April 7.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Pigeon creek near Westeros, for 1916—*Concluded*

Day	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	4.58	93	3.51a	34.0	2.75	6.1	2.63a	4.0
2.....	4.67a	98	3.50a	33.0	2.73a	5.7	2.56a	3.0
3.....	4.76a	104	3.50	33.0	2.71a	5.2	2.59	3.4
4.....	4.85a	110	3.55a	36.0	2.69a	4.8	2.64a	4.1
5.....	4.95	116	3.60	38.0	2.67a	4.6	2.58a	3.2
6.....	4.98a	118	3.56a	36.0	2.65	4.2	2.51a	2.3
7.....	5.00a	120	2.91x	10.1	2.74	5.9	2.65	4.2
8.....	5.02	121	2.89a	9.5	2.79a	7.0	2.84a	8.0
9.....	5.00	120	2.87	9.0	2.83	8.0	2.83a	8.0
10.....	4.98a	118	2.86a	8.8	2.77a	6.5	2.82a	7.7
11.....	4.96a	117	2.85a	8.5	2.72a	5.4	2.90	9.8
12.....	4.94	116	2.84	8.2	2.66a	4.4	2.98a	12.4
13.....	4.94a	116	2.84a	8.2	2.60	3.5	2.95	11.4
14.....	4.95a	116	2.84	8.2	2.70	5.0	2.95a	11.4
15.....	4.95	116	2.81a	7.5	2.80a	7.2	2.94a	11.1
16.....	5.01a	121	2.78	6.8	2.79a	7.0	2.94	11.1
17.....	5.08	126	2.79a	7.0	2.78a	6.8	2.94a	11.1
18.....	5.05a	124	2.81a	7.5	2.78	6.8	2.94a	11.1
19.....	5.01a	121	2.82a	7.7	2.74a	5.9	2.94a	11.1
20.....	4.98a	118	2.84a	8.2	2.60a	4.8	2.94a	11.1
21.....	4.95	116	2.85	8.5	2.65	4.2	2.94	11.1
22.....	4.89a	112	2.85a	8.5	2.63a	4.0	2.95a	11.4
23.....	4.82a	107	2.85a	8.5	2.60	3.5	2.96a	11.7
24.....	4.76a	104	2.85	8.5	2.76a	6.3	2.97a	12.0
25.....	4.69a	99	2.83a	8.0	2.92a	10.4	2.98	12.4
26.....	4.63	96	2.81a	7.5	3.08	15.7	2.98a	12.4
27.....	4.06a	62	2.79a	7.0	2.40	1.2	2.98a	12.4
28.....	3.50	33	2.77a	6.5	2.64	4.1	2.98	12.4
29.....	3.51a	34	2.75	6.1	2.77a	6.5	3.08a	15.7
30.....	3.52	34	2.75a	6.1	2.70a	5.0	3.18a	19.3
31.....	3.51a	34	2.75a	6.1	.....	.....	3.27	23.0

a Gauge height interpolated.

x Sluice-way closed Aug. 7.

MONTHLY DISCHARGE of Pigeon creek near Westeros, for 1916

(Drainage area 120 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (22-31).....	1.20	0.96	1.10	0.000	0.01	22
April.....	80.00	0.80	50.00	0.417	0.46	2,975
May.....	94.00	67.00	83.00	0.691	0.80	5,103
June.....	112.00	93.00	100.00	0.833	0.93	5,950
July.....	126.00	33.00	101.00	0.841	0.97	6,215
August.....	38.00	6.10	13.10	0.109	0.13	806
September.....	15.70	1.20	5.90	0.049	0.06	351
October.....	23.00	2.30	10.10	0.084	0.10	621
The period.....					3.46	22,043

BATTLE RIVER AT PONOKA

Location.—On the SW. $\frac{1}{4}$ Sec. 4, Tp. 43, Rge. 25, W. 4th Mer., at the steel traffic bridge, 300 yards SE. of the C.P.R. depot in the town of Ponoka.

Records available.—May 7, 1913, to December 31, 1916.

Gauge.—Vertical staff; zero elevation maintained at 88.31 since establishment.

Bench-mark.—Permanent iron bench-mark located beside outside pile on upstream side of left abutment; assumed elevation 100.00 feet.

Channel.—One; slightly shifting.

Discharge measurements.—Made from bridge, and in low stages by wading at a point 300 feet up stream.

Winter flow.—Stream affected by ice from November to April.

Observer.—W. Steadman.

DISCHARGE MEASUREMENTS of Battle river at Ponoka, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 12.....	C. M. O'Neil.....	53	60	0.14	2.49	8.4
Jan. 19.....	do.....	50	42	0.15	3.31	6.4
Feb. 16.....	do.....	38	28	0.23	2.20	6.4
Mar. 10.....	do.....	33	26	0.41	3.20	10.7
April 1.....	do.....	80	349	1.34	8.08	469.0
April 7.....	do.....	78	233	1.27	6.27	296.0
April 19.....	O. H. Hoover.....	71	276	0.87	4.25	239.0
May 13.....	C. M. O'Neil.....	107	141	1.45	3.93	204.0
June 9.....	H. S. Kerby.....	77	258	1.53	5.07	394.0
June 29.....	do.....	70	190	1.35	4.18	258.0
July 20.....	do.....	81	312	1.49	5.65	465.0
Aug. 11.....	do.....	69	160	1.21	3.88	193.0
Sept. 1.....	do.....	71	183	1.21	4.05	221.0
Sept. 19.....	do.....	78	391	1.10	5.50	432.0
Oct. 16.....	W. K. Broughton.....	69	226	0.70	3.75	159.0
Nov. 10.....	do.....	70	223	0.40	3.65	89.0
Nov. 30.....	W. T. Reeve.....	68	180	0.54	3.79	98.0
Dec. 21.....	do.....	66	155	0.39	3.75	60.0

SESSIONAL PAPER No. 25a

DAIRY GAUGE HEIGHT AND DISCHARGE of Battle river at Ponoka, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	2.90ab	11.7	2.22	6.3	4.25	29.0	8.08	469	4.08	220	5.28	395
2....	2.96a	11.1	2.20	6.3	4.25	29.0	8.13	440	4.24	239	5.03	354
3....	3.01a	10.7	2.20	6.3	4.20	29.0	7.80	396	4.49	271	5.12	368
4....	3.07	10.0	2.20	6.2	3.90	29.0	7.47	370	4.33	250	5.04	355
5....	3.04	11.0	2.20	6.2	3.65	27.0	7.24	340	4.15	228	5.38	412
6....	2.89	10.7	2.15	6.2	3.40	23.0	6.79	310	4.07	218	5.62	454
7....	2.84	10.2	2.17	6.2	3.20	20.0	6.34	296	3.98	208	5.48	429
8....	2.84	9.6	2.20	6.2	3.12	15.2	6.27	292	3.85	192	5.24	388
9....	2.94	9.4	2.15	6.1	3.05	11.0	5.86	288	3.70	176	5.08	362
10....	2.69	9.1	2.18	6.1	3.10	10.7	6.04	282	3.76	183	5.40	415
11....	2.59	9.0	2.20	6.1	3.65	11.1	5.95	278	3.78	185	6.42	600
12....	2.49	8.4	2.20	6.1	4.55	13.2	5.35	272	3.83	190	6.75	662
13....	2.34	8.2	2.20	6.2	4.60	19.6	4.73	269	3.95	204	6.68	649
14....	2.43	8.1	2.00	6.3	4.70	23.0	4.21	264	3.95	204	6.25	568
15....	2.34	7.8	2.20	6.3	4.80	29.0	4.63b	260	3.95	204	5.70	468
16....	2.29	7.5	2.15	6.4	5.11	34.0	4.33	250	3.96	205	5.31	400
17....	2.34	7.2	2.15	6.4	4.98	39.0	4.28	244	3.90	198	5.13	370
18....	2.29	6.9	2.15	6.3	4.85	42.0	4.27	242	3.84	191	5.10	365
19....	2.34	6.4	2.15	6.3	4.70	46.0	3.94	203	3.75	182	4.98	346
20....	2.29	6.4	2.15	6.3	4.69	48.0	4.16	229	3.75	182	4.84	323
21....	2.29	6.4	2.15	6.4	4.98	55.0	4.06	217	3.70	176	4.84	323
22....	2.34	6.4	2.15	6.4	5.46	145.0	4.00	210	3.75	182	4.66	295
23....	2.34	6.4	2.15	6.5	6.50	275.0	3.90	198	3.80	187	4.44	264
24....	2.34	6.4	3.35	10.0	7.65	395.0	3.80	187	3.99	209	4.28	244
25....	2.29	6.4	3.80	17.0	7.90	425.0	3.71	177	4.85	325	4.15	228
26....	2.24	6.4	3.65	22.0	8.38	510.0	3.79	186	5.09	363	4.03	214
27....	2.34	6.4	4.20	27.0	8.40	508.0	3.67	173	5.04	355	4.01	211
28....	2.29	6.3	4.20	29.0	8.20	504.0	3.71	177	4.82	320	4.06	217
29....	2.29	6.3	4.20	29.0	8.01	492.0	3.85	192	4.69	300	4.18	232
30....	2.26	6.3	.....	.....	8.04a	480.0	3.94	203	4.45	265	4.20	234
31....	2.22	6.3	.....	.....	8.06a	472.0	.....	.....	4.70	301	.....	.....

a Gauge height interpolated.

b Ice conditions, Jan. 1 to April 15.

DAILY GAUGE HEIGHT AND DISCHARGE of Battle river at Ponoka, for 1916—*Concluded*

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	4.24	239	4.43	262	4.04	215	4.31	247	4.11	223	3.77	98
2....	4.32	248	4.27	242	4.41	259	4.19	233	4.07	218	3.76	96
3....	4.51	273	4.67	296	4.64	292	4.10	222	4.02	212	3.67	91
4....	6.10	540	4.61	288	7.23	756	4.11	223	4.06	217	3.56	86
5....	7.61	832	5.16	375	9.42	1,225	4.11	223	3.91	199	3.59	83
6....	8.16	948	5.16	375	9.93	1,344	4.05	216	3.85	192	3.54	80
7....	8.57	1,037	4.86	327	12.26	1,930	4.02	212	3.71	177	3.54	76
8....	9.10	1,154	4.45	265	12.87	2,080	3.99	209	3.73 ^b	160	3.57	73
9....	9.24	1,185	4.26	241	12.53	1,994	3.94	203	3.91	140	3.67	66
10....	8.94	1,119	4.15	228	12.01	1,864	3.89	197	3.70	89	3.67	60
11....	7.97	908	3.80	187	12.47	1,980	3.87	195	3.65	89	3.60	59
12....	6.99	708	3.66 ^a	172	12.02	1,867	3.82	189	3.67	89	3.72	59
13....	6.60	634	3.51	157	11.12	1,642	3.76	183	3.75	90	3.72	61
14....	6.53	621	3.40	146	9.80	1,312	3.85	192	3.72	91	3.73	64
15....	6.39	594	3.26	132	8.28	974	3.75	182	3.64	92	3.74	65
16....	6.06	533	3.19	125	7.00	710	3.75	182	3.66	93	3.75	65
17....	5.57	445	3.18	124	6.38	592	3.90	198	3.68	93	3.77	65
18....	5.48	429	3.25	131	6.01	524	4.25	240	3.74	94	3.78	64
19....	5.73	473	5.02	352	5.52	436	4.50	272	3.76	94	3.81	63
20....	5.65	459	6.54	623	5.18	378	4.58	283	3.87	95	3.77	62
21....	5.53	437	6.56	626	4.86	327	4.90	333	3.92	95	3.75	60
22....	5.08	362	6.30	577	4.64	292	5.01	351	3.95	96	3.78	58
23....	4.91	335	6.00	522	4.42	261	5.16	375	3.98	96	3.78	55
24....	4.78	314	5.71	470	4.30	246	5.01	351	4.00	96	3.77	54
25....	4.71	303	5.36	408	4.24	239	4.87	328	3.91	96	3.78	52
26....	4.72	304	5.12	368	4.48	269	4.73	306	3.99	97	3.82	50
27....	4.82	320	4.75	309	4.42	261	4.61	288	3.99	97	3.82	49
28....	5.05	357	4.35	252	4.24	239	4.46	266	3.94	98	3.79	49
29....	5.23	386	4.07	218	4.21	235	4.27	242	3.90	98	3.80	49
30....	5.41	417	3.88	196	4.20	234	4.06	217	3.79	98	3.80	49
31....	4.86	327	3.79	186	.....	.....	4.22	236	.....	.....	3.78 ^b	50

^a Gauge height interpolated.^b Ice conditions, Nov. 8 to December 31.

MONTHLY DISCHARGE of Battle river at Ponoka, for 1916

(Drainage area 661 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	11.7	6.3	8.0	0.012	0.01	492
February.....	29.0	6.1	8.8	0.013	0.01	506
March.....	510.0	10.7	35.0	0.053	0.06	2,152
April.....	469.0	173.0	264.0	0.399	0.45	15,709
May.....	363.0	176.0	229.0	0.346	0.40	14,081
June.....	662.0	211.0	372.0	0.561	0.63	22,136
July.....	1,185.0	239.0	556.0	0.841	0.97	34,187
August.....	626.0	124.0	296.0	0.448	0.52	18,200
September.....	2,080.0	215.0	833.0	1.260	1.41	49,567
October.....	375.0	182.0	245.0	0.371	0.43	15,064
November.....	223.0	89.0	124.0	0.188	0.21	7,379
December.....	98.0	49.0	65.0	0.098	0.11	3,997
The year.....	.....	.....	.....	.....	5.21	183,470

SESSIONAL PAPER No. 25B

BATTLE RIVER AT BATTLEFORD

Location.—On the NW. $\frac{1}{4}$ Sec. 25, Tp. 43, Rge. 17, W. 3rd Mer., at the traffic bridge about one mile west of the Canadian Northern railway station at Battleford.

Records available.—June 17, 1911, to December 31, 1916.

Gauge.—Chain gauge, 200 feet from initial point of soundings; zero elevation maintained at 83.89 feet since establishment (May 23, 1914).

Bench-mark.—On top of abutment, downstream side of west end of bridge; assumed elevation 100.00 feet.

Channel.—Permanent.

Discharge measurements.—From bridge.

Observer.—R. L. Robson.

DISCHARGE MEASUREMENTS of Battle river at Battleford, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 21, 22.....	F. R. Shenstone.....	106	40.4	0.93	3.37	38
Feb. 24, 25.....	do.....	30	17.9	1.43	3.43	26
Mar. 24.....	do.....	32	19.5	1.18	3.63	23
May 2.....	do.....	200	562.0	2.24	5.35	1,258
May 27.....	do.....	201	457.0	1.69	4.47	777
June 21.....	do.....	206	835.0	2.41	6.77	2,007
July 12.....	F. R. Shenstone and					
	J. R. Estey.....	207	845.0	2.41	6.84	2,038
Aug. 5.....	J. R. Estey.....	205	614.0	2.49	5.89	1,529
Aug. 30.....	F. R. Shenstone.....	204	627.0	2.17	5.84	1,359
Sept. 23.....	do.....	207	863.0	2.45	6.98	2,124
Oct. 19.....	do.....	203	517.0	2.42	5.45	1,251
Nov. 16.....	do.....				4.86	500
Dec. 9.....	do.....	106	244.0	1.29	4.81	314
Dec. 29.....	do.....	93	200.0	0.85	4.92	170

DAILY GAUGE HEIGHT AND DISCHARGE of Battle river at Battleford, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	3.37 ^b	69	3.44	40	3.43	23	4.15	37	5.53	1,323	5.11	1,104
2....	3.37	67	3.42	36	3.45	24	4.19	40	5.33	1,219	4.99	1,042
3....	3.37	65	3.44	38	3.48	25	4.34	45	5.16	1,130	4.86	977
4....	3.36	62	3.46	40	3.49	25	4.49	50	5.07	1,083	4.76	927
5....	3.35	60	3.48	41	3.46	22	5.09	55	5.11	1,104	4.75	922
6....	3.34	58	3.50	42	3.48	22	5.58	60	5.18	1,141	4.73	912
7....	3.33	56	3.49	40	3.45	20	6.14	80	5.31	1,208	4.95	1,022
8....	3.34	55	3.47	39	3.39	18	6.69	120	5.19	1,146	4.97	1,032
9....	3.35	53	3.46	36	3.41	18	7.28	150	5.01	1,052	4.99	1,042
10....	3.35	50	3.47	37	3.42	19	7.31	200	4.92	1,007	5.00	1,047
11....	3.34	49	3.49	38	3.44	20	7.62	400	4.83	962	5.06	1,078
12....	3.33	47	3.51	40	3.43	21	7.95	500	4.80	947	5.33	1,219
13....	3.34	47	3.49	38	3.44	22	11.00 ^x	900	4.73	912	5.35	1,229
14....	3.34	46	3.47	35	3.46	20	16.50	950	4.66	877	5.31	1,208
15....	3.35	45	3.48	37	3.47	20	15.50	1,000	4.72	907	5.53	1,323
16....	3.35	44	3.50	38	3.51	20	12.00	1,300	4.69	892	5.66	1,390
17....	3.34	41	3.47	34	3.52	20	9.50 ^x	1,500	4.65	872	7.31	2,341
18....	3.33	38	3.48	33	3.51	18	7.63	1,600	4.65	872	7.51	2,477
19....	3.33	36	3.48	33	3.53	15	7.34	1,500	4.63	862	7.12	2,215
20....	3.32	35	3.45	33	3.56	15	7.01 ^b	1,450	4.60	847	6.94	2,103
21....	3.36	38	3.44	30	3.68	21	6.83	2,039	4.53	812	6.72	1,977
22....	3.35	38	3.39	26	3.69	24	6.68	1,955	4.51	802	6.58	1,899
23....	3.36	38	3.42	26	3.69	24	6.56	1,888	4.50	797	6.37	1,781
24....	3.35	38	3.43	25	3.70	23	6.34	1,764	4.50	797	6.15	1,658
25....	3.36	37	3.45	25	3.78	25	6.20	1,686	4.49	792	5.97	1,557
26....	3.34	33	3.47	25	3.85	25	6.07	1,613	4.48	787	5.75	1,438
27....	3.38	38	3.46	26	3.94	25	5.92	1,530	4.48	787	5.56	1,338
28....	3.40	39	3.47	26	3.99	27	5.75	1,438	4.46	777	5.44	1,276
29....	3.41	40	3.47	26	4.05	30	5.66	1,390	4.54	817	5.47	1,291
30....	3.38	36	.....	.....	4.09	33	5.65	1,385	4.60	847	5.48	1,297
31....	3.36	34	.....	.....	4.12	35	.....	.....	4.96	1,027	.....	.....

^b Ice conditions from January 1 to April 20.^x Water higher than gauge measures. Elevations estimated from known H.W.M. from April 13 to 17.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Battle river at Battleford, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	5.48	1,297	5.75	1,438	5.46	1,286	7.15	2,235	5.01	1,052	5.08	.....
2....	5.66	1,390	5.75	1,438	5.33	1,219	7.08	2,190	4.99	1,042	5.00	.....
3....	5.76	1,443	5.72	1,422	5.19	1,146	7.01	2,146	4.98	1,037	4.92	.....
4....	5.90	1,519	5.67	1,395	5.16	1,130	6.95	2,109	4.97	1,032	.....	.....
5....	6.05	1,602	6.05	1,602	5.17	1,135	6.82	2,033	4.96	1,027	.....	.....
6....	6.97	2,121	6.02	1,585	5.20	1,151	6.66	1,944	4.95	1,022	.....	.....
7....	6.49	1,848	6.02	1,585	5.35	1,229	6.55	1,882	4.94	1,017	.....	.....
8....	6.05	1,602	6.00	1,574	5.46	1,286	6.43	1,815	4.94	1,017	.....	.....
9....	6.20	1,686	5.76	1,443	5.53	1,323	6.30	1,742	4.91	1,002	4.81	314 <i>d</i>
10....	7.05	2,171	5.53	1,323	6.78	2,011	6.18	1,675	4.87	982	.....	.....
11....	7.10	2,202	5.72	1,422	7.64	2,568	6.08	1,619	4.83	962	.....	.....
12....	6.72	1,977	5.64	1,380	7.55	2,505	5.99	1,568	5.06	1,078	.....	.....
13....	6.42	1,809	5.56	1,338	7.43	2,421	5.92	1,530	.....	1,000 <i>e</i>	.....	.....
14....	6.29	1,736	5.52	1,317	7.35	2,367	5.84	1,487	.....	750 <i>e</i>	.....	.....
15....	6.03	1,591	5.40	1,255	7.19	2,261	5.75	1,438	.....	600 <i>e</i>	.....	.....
16....	5.88	1,508	5.28	1,193	7.16	2,242	5.65	1,385	4.86	500 <i>e</i>	.....	.....
17....	5.88	1,508	5.29	1,198	7.14	2,228	5.53	1,323	.....	500 <i>e</i>	4.81	.....
18....	5.92	1,530	5.24	1,172	7.11	2,209	5.40	1,255	4.95	490 <i>e</i>	.....	.....
19....	5.92	1,530	5.19	1,146	7.12	2,115	5.39	1,250	5.14	480 <i>e</i>	.....	.....
20....	5.90	1,519	5.17	1,135	7.10	2,202	5.35	1,229	5.16 <i>b</i>	480 <i>e</i>	.....	.....
21....	5.95	1,546	5.16	1,130	7.07	2,183	5.32	1,213	5.19	480 <i>e</i>	.....	.....
22....	5.98	1,563	5.21	1,156	7.04	2,165	5.28	1,193	5.21	470 <i>e</i>	.....	.....
23....	6.02	1,585	5.14	1,120	7.01	2,146	5.25	1,177	5.24	450 <i>e</i>	.....	.....
24....	6.02	1,585	5.12	1,109	6.97	2,121	5.21	1,156	5.26	440 <i>e</i>	.....	.....
25....	6.00	1,574	5.05	1,073	7.07	2,183	5.18	1,141	5.28	410 <i>e</i>	.....	.....
26....	6.00	1,574	6.37	1,781	7.18	2,255	5.16	1,130	5.31	400 <i>e</i>	.....	.....
27....	5.99	1,568	6.30	1,742	7.25	2,301	5.13	1,115	5.26	390 <i>e</i>	.....	.....
28....	5.92	1,530	6.09	1,624	7.25	2,301	5.12	1,109	5.24	390 <i>e</i>	.....	.....
29....	5.86	1,497	5.88	1,508	7.25	2,301	5.10	1,099	5.18	380 <i>e</i>	4.92	170 <i>d</i>
30....	5.82	1,476	5.66	1,390	7.19	2,261	5.07	1,083	5.13	375 <i>e</i>	4.96	.....
31....	5.75	1,438	5.53	1,323	.....	.....	5.04	1,068	.....	.....	4.95 <i>b</i>	.....

e Discharge estimated.*x* Mean daily discharge estimated from discharge measurements.*b* Ice conditions November 20 to December 31.*d* Actual measurement.

MONTHLY DISCHARGE of Battle river near Battleford, for 1916

(Drainage area 11,850 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	60	33	46	0.004	0.005	2,828
February.....	42	25	34	0.003	0.003	1,956
March.....	35	15	23	0.002	0.002	1,414
April.....	2,039	37	954	0.080	0.090	56,767
May.....	1,323	777	949	0.080	0.090	58,352
June.....	2,477	912	1,404	0.119	0.130	83,544
July.....	2,202	1,297	1,630	0.138	0.160	100,225
August.....	1,781	1,073	1,365	0.115	0.130	83,931
September.....	2,568	1,130	1,942	0.164	0.180	115,557
October.....	2,235	1,068	1,495	0.126	0.150	91,924
November.....	1,078	375	708	0.060	0.070	42,129
December.....	.....	.....	240 <i>x</i>	0.020	0.020	14,757
The year.....	.....	.....	.....	.....	1.030	653,384

x Estimated from discharge measurements.

NORTH SASKATCHEWAN RIVER AT PRINCE ALBERT

Location.—On River lot 76, Prince Albert settlement, at the Canadian Northern railway and traffic bridge.

Records available.—October 2, 1911, to December 31, 1916.

Gauge.—Chain; zero elevation has been maintained at 1,370.397 feet since establishment.

Bench-mark.—Brass bolt on top of right abutment of bridge, downstream side, marked "P.W.D. B.M. 47." Elevation of bench-mark 1,403.502 feet above mean sea-level, determined by Canadian Geodetic Surveys.

Channel.—Partly boulders, partly sand. Not liable to very great changes.

Discharge measurements.—From bridge at gauge.

Open water.—April 22, to November 19, 1916.

Observer.—W. Moodie.

DISCHARGE MEASUREMENTS of North Saskatchewan river at Prince Albert, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 6, 7, 8.....	F. R. Shenstone.....	646	2,525	0.63	4.16	1,596
Feb. 3, 4.....	do.....	636	2,314	0.47	4.18	1,094
Mar. 7, 8, 9.....	do.....	623	2,157	0.63	4.46	1,349
Mar. 28, 29.....	do.....	629	2,182	0.62	4.55	1,351
May 9.....	do.....	764	4,155	1.98	5.66	8,227
June 2.....	do.....	752	4,337	1.84	5.60	8,000
June 26.....	do.....	883	10,873	4.79	13.70	52,164
June 26.....	do.....	883	11,139	4.89	13.92	54,557
June 29.....	do.....	874	9,413	4.70	11.89	38,994
June 30.....	do.....	872	8,695	4.06	11.22	35,291
July 17.....	J. R. Estey.....	873	9,291	4.25	11.84	39,546
Aug. 9.....	do.....	854	6,922	3.46	9.03	23,922
Aug. 24.....	F. R. Shenstone.....	845	6,513	3.09	8.32	20,149
Sept. 23-29.....	do.....	826	5,576	2.74	7.23	15,328
Oct. 24-25.....	do.....	771	4,396	2.05	5.77	9,012
Nov. 18.....	do.....	711	3,424	1.21	4.78	4,156
Dec. 13-14.....	do.....	815	3,056	1.00	5.70	3,053

Ice conditions, Jan. 1 to April 21, and Nov. 20 to Dec. 31.

Open water conditions April 22 to Nov. 19.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan river at Prince Albert, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	4.17 ^b	1,700	4.17	1,120	4.26	1,200	4.69	1,500	6.87	13,715	5.56	7,820
2....	4.15	1,670	4.17	1,100	4.26	1,210	4.75	1,620	6.84	13,550	5.60	8,000
3....	4.20	1,650	4.20	1,090	4.30	1,220	4.75	1,700	6.35	11,375	5.68	8,360
4....	4.18	1,620	4.18	1,100	4.32	1,250	4.70	1,800	5.85	9,125	6.16	10,520
5....	4.15	1,610	4.15	1,100	4.36	1,280	4.72	1,940	5.48	7,460	6.51	12,095
6....	4.23	1,590	4.15	1,110	4.40	1,300	4.76	2,120	5.40	7,100	6.88	13,760
7....	4.15	1,580	4.15	1,090	4.45	1,330	4.80	2,260	5.39	7,060	7.38	16,010
8....	4.10	1,500	4.18	1,060	4.45	1,350	4.85	2,480	5.49	7,505	8.42	20,816
9....	4.15	1,500	4.17	1,060	4.45	1,360	4.95	2,800	5.66	8,270	9.06	23,900
10....	4.20	1,552	4.17	1,070	4.46	1,380	5.01	3,050	5.73	8,585	8.78	22,544
11....	4.23	1,620	4.15	1,070	4.48	1,390	5.11	3,320	6.26	10,970	8.57	21,536
12....	4.25	1,660	4.14	1,060	4.35	1,300	5.21	3,680	7.18	15,110	8.92	23,215
13....	4.20	1,650	4.14	1,050	4.30	1,160	5.45	4,000	7.36	15,920	9.12	24,200
14....	4.18	1,600	4.14	1,040	4.30	1,160	6.17	4,500	7.20	15,200	8.90	23,120
15....	4.16	1,560	4.12	1,010	4.35	1,180	7.35	5,200	6.94	14,030	8.59	21,632
16....	4.13	1,500	4.10	1,040	4.39	1,220	7.64	5,800	6.69	12,905	8.39	20,672
17....	4.11	1,450	4.12	1,070	4.46	1,300	8.15	6,200	6.41	11,645	8.22	19,856
18....	4.07	1,400	4.14	1,100	4.52	1,370	9.21	7,100	6.14	10,430	8.29	20,192
19....	4.05	1,380	4.16	1,120	4.49	1,300	10.72	8,000	5.87	9,215	8.43	20,864
20....	4.02	1,350	4.16	1,150	4.43	1,240	10.96	8,500	5.65	8,225	8.51	21,248
21....	4.00	1,200	4.17	1,180	4.46	1,250	8.65 ^b	10,000	5.46	7,370	8.35	20,480
22....	3.95	1,080	4.19	1,200	4.46	1,260	7.78	17,810	5.34	6,869	8.28	20,144
23....	3.95	1,100	4.21	1,220	4.49	1,280	6.87	13,715	5.28	6,620	8.46	21,008
24....	3.97	1,130	4.24	1,230	4.49	1,290	6.86	13,670	5.20	6,300	11.23	35,422
25....	3.99	1,170	4.24	1,220	4.50	1,300	6.90	13,850	5.18	6,220	12.25	41,710
26....	4.06	1,200	4.24	1,200	4.52	1,320	7.17	15,065	5.22	6,380	13.79	53,120
27....	4.12	1,240	4.24	1,200	4.55	1,340	7.93	18,485	5.25	6,500	13.80	53,200
28....	4.16	1,270	4.23	1,200	4.55	1,340	7.44	16,280	5.24	6,460	12.68	44,660
29....	4.17	1,210	4.26	1,200	4.55	1,360	6.88	13,760	5.21	6,340	11.80	38,800
30....	4.16	1,190	.....	.....	4.65	1,400	6.61	12,545	5.27	6,580	11.12	34,790
31....	4.18	1,160	.....	.....	4.68	1,440	.....	.....	5.44	7,280	.....	.....

^b Ice conditions, January 1 to April 21; discharge from winter graph.

DAILY GAUGE HEIGHT AND DISCHARGE of North Saskatchewan river at Prince Albert,
for 1916—*Concluded*

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	10.66	32,230	8.52	21,296	9.20	24,600	7.02	14,390	6.54	12,230	6.84	4,150
2....	10.40	30,800	8.40	20,720	9.22	24,700	7.02	14,390	6.48	11,960	7.00	4,130
3....	10.43	30,965	10.00	28,600	8.98	23,504	6.98	14,210	6.34	11,330	7.03	4,110
4....	11.00	34,100	11.43	36,580	8.81	22,688	6.91	13,895	6.24	10,880	6.98	4,070
5....	11.42	36,520	10.86	33,330	8.64	21,872	7.00	14,300	6.20	10,700	6.78	3,990
6....	11.20	35,250	10.23	29,865	8.50	21,200	6.90	13,850	6.14	10,430	.....	3,890
7....	10.81	33,055	9.69	27,050	8.40	20,720	6.72	13,040	6.04	9,980	.....	3,790
8....	10.44	31,020	9.20	24,600	8.49	21,152	6.62	12,590	5.93	9,485	.....	3,700
9....	10.37	30,635	9.04	23,800	8.69	22,112	6.48	11,960	5.67	8,315	.....	3,600
10....	11.91	39,466	9.14	24,300	9.05	23,850	6.43	11,735	5.44	7,280	.....	3,490
11....	13.02	47,150	9.57	26,450	10.61	31,955	6.40	11,600	5.07	5,780	.....	3,380
12....	12.16	41,116	9.98	28,500	11.66	37,960	6.34	11,330	4.28	2,890	.....	3,260
13....	11.43	36,580	9.59	26,550	11.31	35,882	6.24	10,880	3.90	2,000	5.65	3,150
14....	10.94	33,770	9.24	24,800	10.77	32,835	6.13	10,385	3.95	2,100	5.75	3,050
15....	10.83	33,165	8.94	23,312	10.26	30,030	6.09	10,205	4.81	4,740	5.77	3,000
16....	11.76	38,560	8.76	22,448	9.94	28,300	6.07	10,115	4.68	4,230	5.70	2,950
17....	11.86	39,160	8.80	22,640	9.84	27,800	6.08	10,160	4.50	3,600	5.58	2,900
18....	11.46	36,760	.....	22,928 ^e	9.50	26,100	6.02	9,890	4.80	4,700	5.55	2,880
19....	11.04	34,330	8.92	23,216	9.02	23,700	5.99	9,755	5.08	5,820	5.60	2,850
20....	11.20	35,250	8.69	22,112	8.54	21,392	5.95	9,575	5.26 ^b	4,090	5.55	2,800
21....	11.35	36,112	8.32	20,336	8.34	20,432	5.85	9,125	5.38	4,100	5.48	2,760
22....	10.76	32,780	8.15	19,520	8.13	19,424	5.84	9,080	5.35	4,100	5.45	2,720
23....	10.14	29,370	8.15	19,520	7.84	18,080	5.83	9,035	5.38	4,110	5.41	2,690
24....	9.86	27,900	8.32	20,336	7.66	17,270	5.77	8,765	5.66	4,120	5.35	2,670
25....	10.34	30,470	8.78	22,544	7.47	16,415	5.78	8,810	6.04	4,140	.....	2,620
26....	10.58	31,790	9.81	27,650	7.33	15,785	5.96	9,620	6.36	4,160	.....	2,600
27....	10.04	28,820	10.52	31,460	7.26	15,470	6.46	11,870	6.31	4,180	.....	2,550
28....	9.50	26,100	10.04	28,820	7.21	15,245	6.93	13,985	6.56	4,190	.....	2,500
29....	9.12	24,200	9.50	26,100	7.20	15,200	6.86	13,670	6.57	4,190	.....	2,470
30....	8.73	22,304	9.12	24,200	7.12	14,840	6.72	13,040	6.67	4,180	.....	2,450
31....	8.40	20,720	9.12	24,200	.....	.....	6.60	12,500	.....	.....	.....^b	2,420

^e Discharge estimated.^b Ice conditions from November 20 to December 31; discharge from winter graph.

MONTHLY DISCHARGE of North Saskatchewan river at Prince Albert, for 1916

(Drainage area 59,900± square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	1,700	1,080	1,422	0.024	0.03	87,414
February.....	1,230	1,010	1,160	0.019	0.02	66,708
March.....	1,440	1,160	1,293	0.022	0.02	79,485
April.....	18,485	1,500	7,425	0.124	0.14	441,713
May.....	15,920	6,220	9,366	0.156	0.18	575,756
June.....	53,200	7,820	24,123	0.403	0.45	1,435,077
July.....	47,150	20,720	32,918	0.549	0.63	2,023,598
August.....	36,580	19,520	25,090	0.419	0.48	1,543,024
September.....	37,960	14,840	23,017	0.384	0.43	1,369,281
October.....	14,390	8,765	11,540	0.193	0.22	709,398
November.....	12,230	2,000	6,134	0.102	0.11	364,912
December.....	4,150	2,420	3,148	0.052	0.06	193,517
^b The year.....	.....	.....	.....	.....	2.77	8,889,853

[±] The drainage area in this table is only approximate.

It must be remembered that the greater part of the run-off at this station is derived from the eastern slope of the Rocky mountains, and must not be used to base estimates of run-off on other streams in this vicinity.

MONTHLY DISCHARGE of North Saskatchewan river at Prince Albert, for 1915

(Drainage area 59,900^a square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	2,150	1,280	1,760	0.0294	0.03	108,219
February.....	1,800	1,550	1,655	0.0276	0.03	91,914
March.....	2,050	1,570	1,707	0.0285	0.03	104,960
April.....	18,500	2,250	9,046	0.1510	0.17	538,274
May.....	10,700	4,820	7,003	0.1169	0.13	430,597
June.....	42,660	9,940	25,023	0.4177	0.47	1,488,972
July.....	186,546	33,200	60,224	1.0054	1.16	3,703,029
August.....	36,430	21,850	28,129	0.4696	0.54	1,729,585
September.....	24,460	9,150	14,999	0.2504	0.28	892,503
October.....	9,190	6,030	7,653	0.1278	0.15	470,564
November.....	6,010	2,620	3,896	0.0650	0.07	231,828
December.....	2,880	1,700	2,238	0.0374	0.04	137,609
The year.....					3.10	9,928,054

^a The drainage area in this table is only approximate.

It must be remembered that the greater part of the run-off at this station is derived from the eastern slope of the Rocky mountains, and must not be used to base estimates of run-off on other streams in this vicinity.

SESSIONAL PAPER No. 25a

MEAN MONTHLY DISCHARGE in Second-feet of North Saskatchewan river at Prince Albert

MONTH	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		b 8,120	d 7,902	10,024	7,114	7,763	7,653	11,540	8,666	542,200
November.....				4,915	3,022	3,736	3,896	6,134	4,341	258,267
December.....				2,315	1,819	2,533	2,238	3,148	2,411	148,212
January.....				1,505	1,663	1,221	1,760	1,422	1,514	93,101
February.....				1,584	1,583	1,191	1,655	1,160	1,435	80,759
March.....				1,579	1,981	1,295	1,707	1,293	1,571	96,554
April.....				9,022	16,330	4,350	9,046	7,425	9,237	549,475
May.....		c 9,817		11,280	12,149	13,235	7,003	9,366	10,607	652,143
June.....	a 16,600	14,828	14,864	19,042	30,347	25,023	24,123	21,371	21,371	1,104,950
July.....	15,346	25,956	35,301	26,186	29,456	60,224	32,918	32,198	32,198	1,979,715
August.....	13,904	25,682	30,044	25,096	14,550	28,129	25,090	23,214	23,214	1,427,390
September..	12,609	16,438	22,277	14,576	10,304	14,999	23,017	16,317	16,317	970,895
Total in Acre-feet.	2,845,134	5,905,568	8,193,612	8,235,406	7,147,276	8,943,435	8,462,027	.....	.....	7,903,661

a 22-30.

b 1, 8, 31.

c 8-31.

d 1-29.

SPRUCE (LITTLE RED) RIVER NEAR PRINCE ALBERT

Location.—On the SW. $\frac{1}{4}$ Sec. 26, Tp. 49, Rge. 26, W. 2nd Mer.

Records available.—July 14, 1916, to October 31, 1916; discharge measurements only in 1916.

Gauge.—Vertical staff; zero elevation has been maintained at an elevation of 89.62 feet since establishment.

Bench-mark.—Spike in top of eight-inch poplar stump on right bank; 100 feet up stream from gauge; assumed elevation 100.00 feet.

Channel.—Shifting silt; gauge height affected by logs lying in or being driven down river.

Discharge measurements.—Made with current-meter at or near gauge by wading, or from bridge one mile down stream.

Fluctuations in flow.—Caused by artificial regulation of lake outlets.

Winter flow.—Discharge measurements have been made, but no gauge height observations taken.

Remarks.—Unable to obtain a gauge observer on this stream. Log drives prevented gaugings during open water season.

DISCHARGE MEASUREMENTS of Spruce river near Prince Albert, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft</i>
Jan. 8.....	F. R. Shenstone.....	7.5	1.83	0.42	0.62	0.78
Feb. 5.....	do.....	5.7	2.04	0.48	2.00	0.98
Mar. 9.....	do.....					0.50e
Mar. 29.....	do.....	3.2	0.21	Nil	Nil	Nil
May 9.....	do.....				3.10	150.00e
June 3.....	do.....				3.71	400.00e
July 18.....	J. R. Estey.....					250.00e
Aug. 25.....	F. R. Shenstone.....					100.00e
Sept. 29.....	do.....	27.0	20.40	1.36	.....	28.00
Oct. 25.....	do.....	27.5	31.60	1.42	.....	45.00
Nov. 20.....	do.....	29.0	41.50	1.64	.....	69.00
Dec. 14.....	do.....	29.0	1.44	0.86	.....	1.24

e Discharge estimated from field inspection; logs running May 9, June 3, July 18, Aug. 25, prevented gauging.

MISCELLANEOUS DISCHARGE MEASUREMENTS made in North Saskatchewan river
drainage basin, in 1916

Date	Engineer	Stream	Location	Width	Area of Section	Mean Velocity	Discharge
				<i>Feet</i>	<i>Sq. feet</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
Oct. 26	C. M. O'Neil	Bighorn river	250 ft. above falls Sec. 33-39-17-5	32.5	26.7	3.14	84.00
Oct. 12	do	Clearwater river . .	4 mi. above Idlewild F.S. Sec. 29-35-11-5	88.0	135.4	2.75	372.00
Oct. 13	do	do	At mouth of Dry channel Sec. 19-34-12-5	83.5	127.0	2.57	326.00
Oct. 14	do	do	Near Indian Head camp Sec. 13-33-15-5	52.0	57.2	2.85	163.00
Aug. 13	do	Carol creek	At Head of canyon Sec. 12-37-19-5	46.5	42.1	0.90	108.00
Aug. 11	do	Pinto creek	At outlet from Pinto lake (Moin) Sec. 33-36-21-5	47.5	31.5	1.25	40.00
Oct. 3	do	Ram river	500 ft. below forks (N. Fork) Sec. 2-35-12-5	76.8	160.6	2.41	400.00
Oct. 4	do	do	Near Rough F.S. (S. Fork) Sec. 25-38-15-5	62.0	62.0	1.09	67.00
Sept. 19	do	do	About 12 miles above mouth Sec. 9-35-15-5	34.0	34.3	1.76	60.00
Sept. 21	do	do	1½ miles above High falls Sec. 19-36-13-5	52.0	73.5	4.23	313.00
Nov. 2	do . .	Saunders creek	50 ft. below C.N.R. trestle Sec. 24-40-13-5	4.5	1.4	0.67	0.90
Sept. 18	do	Whiterabbit creek .	6 mi. below Whiterabbit F.S. Sec. 9-35-16-5	16.0	16.5	2.05	40.00

NOTE.—Locations by sections; approximations only.

RED DEER RIVER DRAINAGE BASIN

General Description

The Red Deer river rises in the Sawback range of the Rocky mountains in the northern portion of the Rocky Mountain park, near the boundary between the provinces of Alberta and British Columbia. It flows eastward for about forty miles, then northeastward for seventy or eighty miles to a point near Red Deer, Alberta. From here the river flows in a southeasterly and easterly direction to its confluence with the South Saskatchewan river, just east of the 4th Mer., in Tp. 22, Rge. 28, W. 3rd Mer. It has a length of approximately 400 miles.

The valley of the Red Deer is wide and deep, the banks being rough and cut up with a large number of deep coulees draining into the river. Near the source the basin is well timbered, and a good growth of timber is found along its banks for some distance out into the prairie. Seams of coal, well suited for domestic use, are found in the valley and form the principal source of fuel supply for the settlers along the stream in the prairie section.

The river carries a considerable supply of water at all times of the year, but the volume is subject to sudden variations, due to the melting of snow in the mountains and heavy summer rains.

Of the tributaries of the Red Deer, the most important are the Panther river near its head, Little Red Deer and Medicine rivers entering in Tp. 36, Rge. 1, W. 5th Mer., and Rosebud river emptying into it in Tp. 28, Rge. 19, W. 4th Mer. In addition, there are numerous small streams draining into the main river in the western portion of the basin. From the mouth of the Rosebud river eastward, there is very little drainage into the river.

Very little water is taken from the Red Deer and its branches for irrigation purposes. There are only a few small schemes on some of the smaller tributaries. The land along the valley, though lacking moisture, is extremely fertile and with the help of irrigation much of it might be cultivated and fine crops produced. The irrigation of the bench land from the river would be difficult on account of the small fall in the river, the depth of the valley and the rolling nature of the lands in the drainage basin.

Very little hydrometric work has been done in this basin as yet. A gauging station was established on the Red Deer river near Innisfail in 1910, but an observer could not be secured and only periodic measurements were secured at this station. In December, 1911, another gauging station was established at the town of Red Deer, and continuous records have been obtained since then. In October, 1915, a station was established in the town of Drumheller, and has been maintained up to the present.

SESSIONAL PAPER No. 25a

Of the tributaries of the Red Deer river, Berry and Blood Indian creeks are the only ones that have, until recently, been given any attention. These small creeks, which drain into the river in the prairie section, have a few small irrigation rights registered against them. Gauging stations were established on them in 1911, but owing to the high cost of obtaining data they were abandoned in 1913. Records were, however, started on Blindman river in 1914.

A special report upon the floods in this drainage basin was published in an Appendix to the 1915 report.

RED DEER RIVER AT RED DEER

Location.—On the SE. $\frac{1}{4}$ Sec. 20, Tp. 38, Rge. 27, W. 4th Mer., at the steel traffic bridge in the town of Red Deer.

Records available.—January 1, 1912, to December 31, 1916.

Gauge.—Chain: Length of chain from bottom of weight to marker is 29.52 feet; zero elevation of gauge maintained at 48.40 feet since establishment.

Bench-mark.—Marked with white paint on northwest face of north abutment; assumed elevation 100.00 feet.

Channel.—Slightly shifting.

Discharge measurements.—Made from bridge.

Winter flow.—From November to April, river is frozen over and measurements are made at a point about one-half mile below the bridge.

Observer.—C. H. Snell.

DISCHARGE MEASUREMENTS of Red Deer river at Red Deer, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 19.....	O. H. Hoover.....	281	295	1.60	5.95	471
Feb. 16.....	S. H. Frame.....	209	168	1.90	5.91	319
Mar. 10.....	O. H. Hoover.....	220	324	1.72	6.26	558
April 5.....	do.....	250	829	2.03	8.03	1,684
April 20.....	do.....	278	939	2.27	4.81	2,132
April 22.....	do.....	277	915	1.90	4.70	1,823
May 15.....	C. M. O'Neil.....	278	909	1.78	4.68	1,621
June 10.....	H. S. Kerby.....	382	2,144	3.93	7.68	8,427
June 20.....	J. R. Estey.....	418	2,903	5.90	9.38	17,104
June 24.....	A. W. Lowrie.....	383	1,991	4.20	7.35	8,365
June 30.....	H. S. Kerby.....	411	2,569	4.68	8.58	12,059
July 26.....	do.....	383	1,924	3.77	7.07	7,268
Aug. 19.....	do.....	423	3,390	6.96	11.09	23,592
Aug. 20.....	do.....	423	3,527	7.09	11.36	24,992
Sept. 2.....	do.....	374	1,614	3.53	6.71	5,698
Sept. 29.....	W. K. Broughton.....	352	1,211	2.85	5.08	3,452
Oct. 20.....	do.....	353	1,291	2.93	5.86	3,779
Nov. 10.....	do.....	280	.....	.....	4.87	2,200 ^e
Dec. 1.....	W. T. Reeve.....	423	853	1.27	6.41	1,088
Dec. 22.....	do.....	407	575	1.36	6.22	792

^e Discharge estimated, from gauge height and velocity.

DAILY GAUGE HEIGHT AND DISCHARGE of Red Deer river at Red Deer, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	5.84 ^b	460	5.83	362	6.19	382	7.73	1,650	4.77	2,003	9.95	17,980
2....	5.79	450	5.83	372	6.28	390	7.78	1,660	5.68	3,460	9.35	15,275
3....	5.78	440	5.86	378	6.27	400	8.43	1,650	6.16	4,452	8.75	12,558
4....	5.73	445	5.88	380	6.29	412	8.73	1,650	6.15	4,430	8.82	13,024
5....	5.74	460	5.87	380	6.24	420	8.00	1,684	6.06	4,232	9.02	13,865
6....	5.86	478	5.87	376	6.22	435	7.71 ^a	1,750	5.80	3,700	8.70	12,530
7....	5.96	466	5.87	370	6.22	458	7.42	1,810	5.58	3,264	8.19	10,563
8....	6.03	450	5.87	360	6.23	490	7.49	1,810	5.43	2,994	7.88	9,428
9....	6.08	435	5.88	350	6.25	520	7.85	1,814	5.17	2,555	7.73	8,902
10....	6.10	420	5.88	346	6.27	558	7.68	1,846	5.02	2,330	7.76	9,004
11....	6.05	420	5.89	335	6.45	590	7.34	2,230	4.87	2,131	7.67	8,698
12....	6.02	425	5.92	326	6.64	635	7.12	2,400	4.76	1,990	7.46	8,012
13....	5.95	432	5.92	318	8.28	710	6.73	2,940	4.70	1,915	7.32	7,572
14....	5.93	440	5.91	314	9.09	772	5.58 ^b	3,210	4.68	1,890	7.36	7,696
15....	5.94	442	5.89	310	8.24	772	5.67	3,440	4.68	1,890	7.70	8,800
16....	5.93	452	5.95	319	7.54 ^a	756	5.79	3,680	4.67	1,878	8.40	11,360
17....	5.92	460	6.01	340	7.24	752	5.36	2,872	4.66	1,865	8.80	12,940
18....	5.92	463	6.42	368	7.31	756	5.13	2,495	4.68	1,890	8.78	12,858
19....	5.94	471	7.25	394	7.07	760	4.96	2,248	4.70	1,965	8.89	13,318
20....	5.93	470	6.88	414	7.23	790	4.85	2,105	4.78	2,015	9.39	15,447
21....	5.92	450	6.84	428	7.51	870	4.75	1,978	4.80	2,040	9.62	16,450
22....	5.92	400	7.02	433	8.21	984	4.69	1,902	4.77	2,003	9.80	17,260
23....	5.90	370	6.98	440	10.60	1,160	4.58	1,766	4.74	1,965	7.92	9,572
24....	5.86	360	7.22	440	11.23	1,290	4.48	1,646	4.85	2,105	7.54	8,268
25....	5.69	350	6.72	438	10.25	1,294	4.42	1,574	5.33	2,821	7.36	7,696
26....	5.76	340	6.68 ^a	424	9.56	1,294	4.41	1,562	5.80	3,700	7.35	7,665
27....	5.77	320	6.50 ^a	404	8.94	1,304	4.58	1,766	6.08	4,276	7.89	9,464
28....	5.77	322	6.40 ^a	390	8.82	1,332	4.89	2,157	6.53	5,325	9.36	15,318
29....	5.81	324	6.30	380	8.35	1,390	4.95	2,235	7.25	7,355	9.03	13,908
30....	5.82	336	.....	.....	8.01	1,465	4.79	2,028	8.33	11,094	8.54	11,892
31....	5.82	348	.....	.....	7.93	1,550	.....	.....	9.42	15,577	.....	.....

^a Gauge height interpolated.^{b-b} Ice conditions.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Red Deer river at Red Deer, for 1916—*Concluded*

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	7.94	9,644	6.52	5,300	6.44	5,100	5.67	3,440	5.32	2,804	6.52	1,090
2	7.75	8,970	6.24	4,632	6.69	5,725	5.73	3,560	5.28	2,736	6.63	1,070
3	8.28	10,904	6.34	4,862	6.63	5,575	5.69	3,480	5.21	2,617	6.50	1,050
4	9.34	15,232	6.71	5,775	8.17	10,489	5.64	3,380	5.24	2,668	6.53	1,030
5	9.75	17,035	7.01	6,630	10.76	21,944	5.56	3,228	5.20	2,600	6.40	996
6	9.01	13,822	7.01	6,630	10.47	20,523	5.54	3,192	5.16	2,540	6.26	950
7	8.46	11,588	6.83	6,090	9.45	15,708	5.59	3,282	4.90	2,170	5.92	900
8	8.33	11,094	6.64	5,600	8.69	12,489	5.57	3,246	4.86	2,118	5.87	870
9	8.41	11,398	6.40	5,000	8.32	11,056	5.47	3,066	4.91	2,183	5.75	850
10	8.37	11,246	6.22	4,586	7.95	9,680	5.41	2,958	4.89	2,157	5.83	850
11	7.93	9,608	6.41	5,025	7.71	8,834	5.39	2,923	4.57b	1,754	6.03	850
12	7.53	8,236	6.51	5,275	7.43	7,916	5.34	2,838	6.08	1,750	5.82	870
13	7.25	7,355	5.92	3,940	7.15	7,050	5.32	2,804	6.08	1,765	6.05	880
14	7.27	7,417	5.78	3,660	7.12	6,960	5.25	2,655	6.08	1,778	6.33	885
15	6.89	6,270	5.64	3,380	6.92	6,360	5.27	2,719	6.08	1,774	6.33	880
16	6.57	5,425	5.53	3,174	6.69	5,725	5.27	2,719	6.09	1,750	6.51	870
17	6.58	5,450	5.58	3,264	6.50	5,250	5.45	3,030	6.09	1,720	6.60	850
18	6.91	6,330	5.82	3,740	6.38	4,954	5.79	3,680	6.09	1,680	6.46	830
19	7.29	7,479	10.18	19,102	6.19	4,518	5.91	3,920	6.38a	1,630	6.44	820
20	7.19	7,170	11.34	21,874	6.08	4,276	5.88	3,860	6.67a	1,590	6.41	810
21	6.71	5,775	10.34	19,886	5.97	4,040	5.91	3,920	6.96a	1,540	6.41	800
22	6.45	5,123	9.14	14,375	5.87	3,840	5.97	4,049	7.25	1,490	6.22	790
23	6.21	4,563	8.56	11,968	5.80	3,700	6.02	4,144	6.92	1,440	6.10	760
24	6.03	4,166	8.28	10,904	5.75	3,600	6.00	4,100	6.87	1,400	6.04	710
25	6.39	4,977	7.81	9,176	5.73	3,560	6.04	4,188	6.74	1,340	6.04	680
26	7.08	6,840	7.34	7,634	5.76	3,620	5.98	4,060	6.80	1,280	5.97	670
27	7.55	8,300	7.03	6,690	5.78	3,660	5.94	3,980	6.70	1,240	5.90	670
28	7.48	8,076	6.84	6,120	5.73	3,560	5.83	3,760	6.75	1,190	5.92	670
29	7.36	7,696	6.54	5,550	5.68	3,460	5.66	3,420	6.34	1,150	5.85	710
30	7.04	6,720	6.39	4,977	5.61	3,380	5.49	3,048	6.41	1,120	5.75	730
31	6.75	5,875	6.37	4,931			5.47	3,066			5.80b	740

b-b Ice conditions.

MONTHLY DISCHARGE of Red Deer river at Red Deer, for 1916

(Drainage area 4,396 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January	478	320	416	0.095	0.11	25,579
February	440	310	375	0.085	0.09	21,570
March	1,550	382	829	0.190	0.22	50,973
April	3,680	1,502	2,119	0.482	0.54	126,089
May	15,577	1,865	2,939	0.668	0.77	180,712
June	17,980	7,572	11,587	2.636	2.94	689,474
July	17,035	4,166	8,380	1.906	2.20	515,270
August	24,874	3,174	7,502	1.706	2.00	461,280
September	21,944	3,380	7,218	1.642	1.83	429,501
October	4,188	2,685	3,411	0.776	0.89	209,734
November	2,804	1,120	1,832	0.417	0.47	109,012
December	1,090	670	843	0.192	0.22	50,162
The year					12.28	2,869,336

MEAN MONTHLY DISCHARGE in Second-feet of Red Deer river at Red Deer

MONTH	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-feet	Mean in Acre-feet
October		2,721	1,223	1,439	2,934	3,411	2,346	144,226
November		1,290	825	783	1,195	1,832	1,185	70,512
December		545	327	328	520	843	513	31,184
January	238	417	278	278	416		325	20,008
February	274	396	298	271	375		323	18,186
March	401 ^a	410	380	606	829		556	34,202
April	1,919	3,887	902	1,251	2,119		2,016	119,937
May	3,954	4,101	1,908	4,457	2,939		3,472	213,473
June	3,953	4,946	3,669	12,308	11,587		7,293	433,940
July	10,091	5,242	2,351	16,748	8,380		8,562	526,478
August	4,985	3,284	1,309	8,118	7,502		5,040	309,873
September	4,532	1,787	1,098	3,954	7,218		3,718	221,224
Total in acre-feet	1,841,836	1,758,762	881,101	3,069,743	2,783,934			2,143,243

^a 1-28.

BLINDMAN RIVER NEAR BLACKFALDS

Location.—On the NE. $\frac{1}{4}$ Sec. 17, Tp. 39, Rge. 27, W. 4th Mer., two and one-half miles southwest of Blackfalds, Alberta, and eight miles north of Red Deer.

Records available.—Discharge measurements from August 10, 1912, to December 31, 1916. Gauge heights from April 21, 1916, to December 31, 1916.

Gauge.—Vertical staff; elevation of zero maintained at 81.89 feet.

Bench-mark.—Nail in spruce post set four feet into the ground, fifty feet down stream from the staff gauge; assumed elevation 100.00 feet; auxiliary bench-mark on southwest wing wall of bridge; assumed elevation 100.00 feet.

Channel.—One, fairly permanent channel; bed composed of mud and large boulders.

Discharge measurements.—Made by wading at the gauge during low water; during high water measurements made at the traffic bridge two miles down stream.

Winter measurements.—Stream affected by ice from November to April.

Observer.—W. Kinman.

Remarks.—The services of an observer were not obtainable until April 21, 1916.

Accuracy.—Gauge heights were read daily at this station to one-hundredth of a foot at a time of mean daily gauge height.

There were two curves during the open water season, one before and one after the period of high water early in July.

Either one or other of these curves run through all plotted discharge measurement points and results are well within the limit of error.

The winter discharges are obtained from graphs based upon gauge heights, temperatures and occasional discharge measurements and are fair estimates.

DISCHARGE MEASUREMENTS of Blindman river near Blackfalds, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 25	O. H. Hoover	50	64	0.09	8.65	5.9
April 4	do	85	256	1.41	10.05	362.0
April 21	do	69	161	1.10	6.84	177.0
May 14	C. M. O'Neil	79	154	1.36	6.98	298.0
June 15	H. S. Kerby	90	276	2.02	8.37	559.0
June 22	J. R. Estey	84	160	1.66	7.34	261.0
July 6	H. S. Kerby	113	665	3.30	12.39	2,189.0
July 20	do	89	290	1.87	7.93	488.0
Aug. 11	do	85	194	1.50	7.20	292.0
Sept. 7	do	109	560	2.87	11.33	1,609.0
Sept. 28	W. K. Broughton	85	197	1.44	7.16	282.0
Oct. 19	do	86	218	1.52	7.42	333.0
Nov. 11	do	82	158	0.58	6.51	92.0
Dec. 1	W. T. Reeve	80	180	0.40	6.55	71.0
Dec. 23	do	82	220	0.30	6.80	67.0

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Blindman river near Blackfalds, for 1916

DAY	April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			7.12	224	8.11	473
2.....			7.26	29	8.13	480
3.....			7.51	304	7.82	384
4.....			7.43	286	7.78	373
5.....			7.26	249	8.04	451
6.....			7.14	228	8.14	483
7.....			7.06	215	7.85	392
8.....			6.96	199	7.63	334
9.....			6.86	185	7.53	310
10.....			6.80	177	8.15	486
11.....			6.77	173	8.86	716
12.....			6.81	178	9.58	963
13.....			6.88	188	9.16	816
14.....			6.98	202	8.79	693
15.....			7.04	211	8.37	556
16.....			7.01	207	7.87	398
17.....			6.94	197	7.69	350
18.....			6.86	185	7.54	312
19.....			6.79	176	7.44	288
20.....			6.69	164	7.43	286
21.....	6.84	183	6.67	162	7.42	284
22.....	6.82	180	6.63	157	7.34	266
23.....	6.71	166	6.67	162	7.14	228
24.....	6.64	158	6.89	190	7.00	205
25.....	6.56	150	7.29	255	6.90	191
26.....	6.52	146	7.40	279	6.85	184
27.....	6.51	145	7.65	340	6.97	201
28.....	6.58	152	7.54	312	7.21	240
29.....	6.68	163	7.47	295	7.22	242
30.....	6.84	183	7.49	300	7.14	228
31.....			7.81	381		

DAILY GAUGE HEIGHT AND DISCHARGE OF Blindman river near Blackfalds, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	7.10	221	7.69	404	7.09	271	7.10	273	6.90	241	6.53	71
2....	7.30	257	7.74	419	7.37	324	7.06	266	6.89	240	6.58	69
3....	7.77	370	8.10	526	7.45	341	7.04	263	7.02	259	6.53	66
4....	10.89	1,442	8.43	628	10.31	1,248	7.04	263	6.91	242	6.54	64
5....	12.71	2,141	9.78	1,065	12.24	1,958	7.02	259	6.94	247	6.57	62
6....	12.39	2,016	8.98	804	11.62	1,720	6.97	252	6.78	224	6.59	61
7....	12.02 ^a	1,872	8.39	616	11.29	1,594	6.95	248	6.62	203	6.53	59
8....	11.66	1,735	8.08	520	10.31	1,248	6.95	248	6.94	196	6.52	57
9....	10.76	1,406	7.68	401	10.16	1,196	6.93	246	6.86	191	6.48	56
10....	10.01	1,144	7.38	326	10.17	1,200	6.92	244	6.55	186	6.45	56
11....	9.42	947	7.18	288	9.35	924	6.88	238	6.44	180	6.51	58
12....	8.94	791	7.03	261	8.85	762	6.84	233	6.56	175	6.55	59
13....	8.33	597	6.91	242	8.71	717	6.83	231	6.83	170	6.59	60
14....	8.00	495	6.79	226	8.34	600	6.83	231	6.59	167	6.64	61
15....	8.81	749	6.71	214	8.01	498	6.80	227	6.67	162	6.68	61
16....	8.60	682	6.70	213	7.76	424	6.86	235	6.70	157	6.74	62
17....	8.38	613	6.71	214	7.57	370	7.17	286	6.68	154	6.74	63
18....	8.22	563	7.60	378	7.42	334	7.36	322	6.70	150	6.74	64
19....	8.14	538	9.77	1,062	7.31	313	7.40	330	6.59	145	6.75	65
20....	7.93	474	10.12	1,182	7.25	302	7.46	343	6.54	141	6.77	65
21....	7.55	365	9.78	1,065	7.04	263	7.58	373	6.64	136	6.78	65
22....	7.35	321	8.97	800	7.01	258	7.80	436	6.59	130	6.79	66
23....	7.22	296	8.35	604	6.97	252	7.88	459	6.54	125	6.80	67
24....	7.09	271	7.74	419	6.94	247	7.84	448	6.64	119	6.81	68
25....	7.35	321	7.56	368	7.03	261	7.72	413	6.63	114	6.84	69
26....	7.38	326	7.45	341	7.20	292	7.60	378	6.54	107	6.84	70
27....	7.45	341	7.23	298	7.20	292	7.48	348	6.53	101	6.85	72
28....	8.54	663	7.07	268	7.14	281	7.34	319	6.55	94	6.85	73
29....	9.48	966	6.96	250	7.12	277	7.22	296	6.56	87	6.86	74
30....	8.78	740	6.92	244	7.11	275	7.09	271	6.55	78	6.83	75
31....	8.23	566	6.98	253	.....	.....	6.94	247	.....	.....	6.81	75

^a Gauge height interpolated.

MONTHLY DISCHARGE of Blindman river near Blackfalds, for 1916

(Drainage area 712 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April (21-30).....	183	145	163	0.229	0.09	3,929
May.....	381	157	227	0.319	0.37	13,958
June.....	963	184	394	0.553	0.62	23,445
July.....	2,141	271	781	1.097	1.26	48,022
August.....	1,182	213	481	0.675	0.78	29,576
September.....	1,958	247	635	0.892	1.00	37,785
October.....	459	227	298	0.418	0.48	18,323
November.....	259	78	164	0.230	0.26	9,759
December.....	75	56	65	0.091	0.10	3,997
The period.....	.....	.....	.....	.....	4.96	188,794

SESSIONAL PAPER No. 25B

RED DEER RIVER AT DRUMHELLER

Location.—On the NW. $\frac{1}{4}$ Sec. 11, Tp. 29, Rge. 20, W. 4th Mer.

Records available.—October 25, 1915, to December 31, 1916.

Gauge.—Vertical staff; elevation of zero maintained at 2,220.22 feet.

Bench-mark.—Canadian topographic survey bench-mark copper plug on right abutment, downstream side; elevation 2,246.89 feet.

Channel.—Permanent.

Discharge measurements.—Made from bridge.

Observer.—S. W. Cameron.

DISCHARGE MEASUREMENTS of Red Deer river at Drumheller, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 8	O. H. Hoover	190	440	0.79	4.60	348
Feb. 22	S. H. Frame				7.05	450 _x
Mar. 14	E. J. Switzer				6.21	670 _x
April 4	H. C. Ritchie	400	1,593	2.25	7.08	3,579
April 25	do	322	1,161	1.88	3.99	2,188
May 16	do	342	1,238	1.88	4.04	2,322
June 6-7	do	438	3,506	4.89	9.68	17,111
June 24	J. R. Estey	425	2,497	4.36	7.77	10,950
July 1	R. J. McGuinness	426	3,203	4.46	8.97	14,304
July 12	H. C. Ritchie	411	2,905	4.56	8.57	13,238
Aug. 4	do	376	1,936	3.30	6.26	6,387
Aug. 20	A. B. Cook	438	4,609	6.39	12.85	29,443
Aug. 21	do	438	4,842	6.15	13.22	29,800 _s
Aug. 21	do	438	4,838	6.15	13.21	29,758
Aug. 21	do	438	4,744	6.11	13.00	28,993
Aug. 22	do	438	4,270	6.02	11.88	25,693
Aug. 22	do	438	4,213	5.90	11.75	24,854 _s
Aug. 22	do	438	3,889	5.60	11.12	21,792
Aug. 23	do	438	3,676	5.23	10.39	19,226
Aug. 23	do	438	3,654	5.19	10.34	18,963 _s
Sept. 14	H. C. Ritchie	404	2,493	3.78	7.42	9,425
Oct. 13	do	334	1,371	2.56	4.88	3,511
Oct. 31	do	356	1,466	2.88	5.25	4,226
Nov. 24	do				5.55	1,100 _x
Dec. 14-15	W. K. Broughton	354	752	1.07	4.52	802

_x Discharge estimated from previous measurements, thickness of ice and gauge height.

_s Slope measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Red Deer river at Drumheller, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	4.28 ^b	545	4.60	385	5.59	410	7.88	3,250	4.23	2,576	10.72	20,522
2....	4.20	540	4.60	390	5.52	415	7.49	3,300	3.83	2,068	10.72	20,522
3....	4.20 ^a	530	4.64	392	5.44	421	7.31	3,420	4.02	2,306	9.22	15,172
4....	4.20	518	4.64	392	5.44	440	7.04	3,580	5.72	5,109	9.00	14,440
5....	3.97	478	4.66	392	5.40	470	7.01	3,400	5.66	4,979	9.42	15,843
6....	3.87	440	4.70	392	5.34	500	6.91	3,000	5.54	4,730	9.82	17,220
7....	4.15	450	4.70	390	5.29	540	6.86	2,660	5.47	4,590	9.23	15,205
8....	4.10	455	4.73	390	5.28	575	6.81	2,780	5.30	4,270	8.56	13,000
9....	4.10	458	4.73	392	5.60	610	6.91	3,100	5.33	4,324	8.27	12,064
10....	4.05	460	4.76	397	6.08	660	6.91	3,220	4.62	3,133	8.26	12,032
11....	4.10	462	4.79	400	6.60	720	6.91	3,420	4.56	3,040	8.16	11,712
12....	4.20	460	4.79 ^a	407	7.30	742	6.31	3,600	4.35	2,734	8.13	11,616
13....	4.35	458	4.80 ^a	415	6.45	695	6.91	3,720	4.35	2,734	7.93	10,976
14....	4.30	457	4.81	425	6.16	670	6.91	3,840	4.05	2,344	7.66	10,119
15....	4.32	445	5.39	455	6.01	750	6.81 ^b	3,980	4.06	2,357	7.60	9,930
16....	4.35 ^a	435	6.99	485	5.86	980	5.26	4,198	4.05	2,344	8.09	11,488
17....	4.38 ^a	422	7.69	502	6.71	1,250	5.21	4,108	4.05	2,344	9.16	14,971
18....	4.41 ^a	412	7.86	511	6.81	1,300	5.16	4,024	4.05	2,344	8.73	13,553
19....	4.45	403	7.69	512	6.25	1,340	5.04	3,826	4.04	2,331	9.00	14,440
20....	4.45	393	7.64	490	6.25	1,370	4.72	3,298	4.02	2,306	8.78	13,715
21....	4.45	386	7.09	460	6.34	1,400	4.64	3,166	4.02	2,306	9.59	16,426
22....	4.48	380	7.05	450	6.46	1,450	4.49	2,935	4.00	2,280	10.00	17,855
23....	4.65	375	7.42	461	6.71	1,470	4.31	2,681	4.13	2,446	8.92	14,176
24....	4.55	368	7.33	492	6.91	1,500	4.15	2,472	4.20	2,536	7.82	10,624
25....	4.55	360	7.16	490	8.63	1,900	4.06	2,357	4.20	2,536	7.25	8,887
26....	4.50	359	6.92	480	12.96	2,700	3.94	2,205	4.22	2,562	7.13	8,552
27....	4.54	357	6.83	462	10.81	2,800	3.83	2,068	5.24	4,162	7.17	8,663
28....	4.54	348	6.72	440	9.56	2,850	3.95	2,217	5.65	4,958	7.63	10,024
29....	4.60	352	6.58	418	9.06	2,900	4.17	2,498	6.00	5,730	10.09	18,179
30....	4.60	366	.....	.....	8.98	3,000	4.31	2,681	7.76	10,434	9.10	14,770
31....	4.60	379	.....	.....	8.28	3,100	.....	.....	8.86	13,978	.....	.....

^a Gauge height interpolated.^b Ice conditions, January 1 to April 15.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Red Deer river at Drumheller, for 1916—*Concluded*

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	8.91	14,143	7.04	8,308	6.22	6,249	5.21	4,108	5.93 ^b	4,000	4.49 ^a	850
2....	8.90	14,110	6.41	6,714	6.43	6,764	5.27	4,216	5.85	3,600	4.47 ^a	850
3....	11.23	22,495	6.38	6,641	6.56	7,082	5.22	4,126	5.85	3,220	4.46 ^a	835
4....	11.57	23,817	6.30	6,445	7.09	8,443	5.25	4,180	5.85	2,960	4.44	830
5....	11.53	23,662	6.56	7,082	12.00	25,490	5.28	4,234	5.81	2,700	4.43	820
6....	11.33	22,884	7.20	8,745	12.77	28,485	5.22	4,126	5.79	2,440	4.48	818
7....	11.73	24,440	6.88	7,884	11.67	24,206	5.16	4,024	5.43	2,200	4.46	825
8....	9.86	17,360	6.64	7,280	11.30	22,767	5.14	3,991	4.92	1,960	4.34	820
9....	9.66	16,667	6.04	5,824	9.58	16,391	5.11	3,941	4.34	1,720	4.32	803
10....	9.11	14,804	6.24	6,298	9.13	14,870	5.06	3,859	4.26	1,640	4.30	790
11....	8.90	14,110	6.36	6,592	8.02	11,264	5.04	3,826	4.21	1,590	4.30	795
12....	8.50	12,805	6.30	6,445	8.76	13,650	4.93	3,645	4.42	1,535	4.29	795
13....	8.20	11,840	6.03	5,800	8.55	12,967	4.92	3,629	4.53	1,480	4.30 ^a	795
14....	7.74	10,371	5.54	4,730	7.43	9,410	4.89	3,579	4.60 ^a	1,415	4.31	802
15....	7.30	9,030	5.34	4,342	7.29	9,002	4.88	3,562	4.67	1,380	4.42	818
16....	7.13	8,552	5.20	4,090	7.00	8,200	4.81	3,446	5.29	1,300	4.47	825
17....	6.74	7,530	5.05	3,842	6.66	7,330	5.05	3,842	6.07	1,260	4.72	832
18....	6.19	6,176	4.34	2,721	6.31	6,469	5.07	3,875	6.37	1,225	4.77	840
19....	6.71	7,455	5.88	5,460	6.20	6,200	5.57	4,790	6.10	1,205	4.84	845
20....	7.88	10,816	12.94	29,146	6.11	5,989	5.65	4,958	6.08	1,180	4.92	845
21....	6.94	8,041	13.19	30,119	5.86	5,415	5.66	4,979	5.82	1,160	4.87	825
22....	6.58	7,130	11.86 ^a	24,945	5.79	5,258	5.69	5,043	5.74	1,140	4.83	800
23....	6.10	5,965	10.53 ^a	19,802	5.73	5,129	5.70	5,065	5.79	1,120	4.79	778
24....	6.98	8,147	9.20	15,105	5.42	4,490	5.74	5,151	5.55	1,100	4.76	760
25....	7.69	10,213	9.05	14,605	5.36	4,378	5.78	5,237	5.37	1,065	4.72	740
26....	8.27	12,064	8.00	11,200	5.31	4,288	5.79	5,258	4.92	1,015	4.67	730
27....	8.21	11,872	7.62	9,993	5.21	4,108	5.75	5,173	4.64	965	4.62	710
28....	7.89	10,848	7.23	8,831	5.25	4,180	5.69	5,043	4.51	915	4.62	700
29....	7.53	9,713	6.74	7,530	5.25	4,180	5.69	5,043	4.40	870	4.62	700
30....	7.53	9,868	6.46	6,837	5.21	4,108	5.47	4,590	4.49	845	4.62	698
31....	7.50	9,620	6.23	6,274	.....	.....	5.27	4,216	.....	.....	4.62 ^b	695

^a Gauge height interpolated.^b Ice conditions, November 1 to December 31.

MONTHLY DISCHARGE of Red Deer river at Drumheller, for 1916

(Drainage area 8,874 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	545	348	428	0.048	0.06	26,317
February.....	512	385	437	0.049	0.05	25,137
March.....	3,100	410	1,288	0.145	0.17	79,196
April.....	4,198	2,068	3,167	0.357	0.40	188,450
May.....	13,978	2,068	3,771	0.425	0.49	231,870
June.....	20,522	8,552	13,556	1.539	1.72	806,638
July.....	24,440	5,965	12,792	1.441	1.66	786,549
August.....	30,119	2,721	9,666	1.089	1.25	594,339
September.....	28,485	4,108	9,892	1.115	1.25	588,615
October.....	5,258	3,446	4,347	0.490	0.56	267,286
November.....	4,000	845	1,674	0.189	0.21	99,610
December.....	850	695	793	0.089	0.10	48,760
The year.....	.....	.....	.....	.....	7.92	3,742,767

SOUTH SASKATCHEWAN RIVER DRAINAGE BASIN

General Description

The upper portion of this drainage basin will be dealt with in the description of the drainage basins of Bow, Little Bow, Oldman, Waterton, Belly and St. Mary rivers. These streams are all conjoined at a point known as the Grand Forks, to form the South Saskatchewan river. From the Grand Forks the river flows in a north and easterly direction to its junction with the North Saskatchewan river a short distance east of the city of Prince Albert. From this point onward the stream takes the name of the Saskatchewan river.

After the confluence of the Bow and Oldman rivers the stream receives comparatively little drainage, the principal tributaries being the Red Deer river, draining that portion of the basin between the North and the South Saskatchewan rivers, and Sevenpersons river and Swiftcurrent creek emptying into the main streams from the south. Descriptions of the drainage basins of all these streams are given elsewhere in this report.

The drainage basin of this stream is quite similar to that of all such streams which have their source in the mountains and flow across the prairies. The upper part of the basin has considerable fall, with rock and gravel formation and a good growth of timber. In contrast to this the prairie section of the basin is sparsely wooded, except along the banks of the stream, and the rock formation changes to earth; also the stream is more apt to change its channel, especially in times of flood. The high water occurs in the hot months of summer and is caused by the melting of the snow fields in the mountains. The low water occurs in the winter months when there is no melting snow to augment the stream flow. Unusually high water and floods follow rains of more than usual intensity in the upper section of the river. The South Saskatchewan river is much less liable to destructive floods than is the North Saskatchewan river.

In addition to the gauging stations on the tributaries, which are taken up in detail elsewhere in this report, there are two stations on the main stream. These stations are located at the cities of Medicine Hat and Saskatoon.

Up to the present the chief value of this stream has been a source of municipal water supply. There are no irrigation schemes or water power developments on the main stream.

The cities of Medicine Hat and Saskatoon derive their water supply from this stream. The South Saskatchewan is also being considered as a possible source of supply for the cities of Moosejaw and Regina. In this connection surveys were carried out during 1913 by this department and also by the Provincial Government.

A special report upon the floods in this drainage basin was published in an Appendix to the 1915 report.

SOUTH SASKATCHEWAN RIVER AT MEDICINE HAT

Location.—On the NW. $\frac{1}{4}$ Sec. 31, Tp. 12, Rge. 5, W. 4th Mer., at the traffic bridge in the city of Medicine Hat.

Records available.—From May 31, 1911, to December 31, 1916.

Gauge.—Standard chain gauge; zero elevation maintained at 2,145.28 feet since establishment.

Bench-mark.—Permanent iron bench-mark; elevation 2,165.50 feet above sea-level (Geodetic Survey of Canada datum).

Channel.—Shifting, owing to sand bed.

Discharge measurements.—Made from traffic bridge.

Winter flow.—Observations taken during winter months.

Observer.—E. King.

SESSIONAL PAPER No. 25b

DISCHARGE MEASUREMENTS of South Saskatchewan river at Medicine Hat, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 6.	W. R. McCaffrey	454.0	2,255	0.67	2.54 ^b	1,516
Jan. 19.	do	444.0	2,281	0.84	3.01 ^b	1,921
Feb. 5.	H. W. Rowley	426.0	2,215	0.87	2.99 ^b	1,938
Feb. 19.	do	860.0	7,867	2.64	11.77 ^b	20,751
Mar. 8.	do	230.0	4,685	0.59	3.92 ^b	2,768
April 5.	E. J. Switzer	522.0	3,744	2.12	3.67	7,926
April 14.	do	579.0	3,932	2.22	4.12	8,714
May 23.	do	585.0	4,232	2.41	4.55	10,180
June 23-24.	do	851.5	11,751	6.22	13.94	73,119
June 27.	do	832.5	9,045	5.21	10.77	47,168
July 20-21.	do	802.5	6,548	4.67	8.65	30,584
Aug. 19.	do	718.5	4,460	2.66	5.14	11,856
Nov. 1.	do	516.6	3,525	1.94	3.45	6,843
Dec. 5.	W. M. Edwards-V. A. Newhall				2.50 ^b	1,800 ^c
Dec. 20.	E. J. Switzer	404.0	2,678	1.15	4.02 ^b	3,068

^b Ice conditions, Jan. 1 to Mar. 18, and Dec. 5 to 31.^c Discharge estimated, from field inspection.

DAILY GAUGE HEIGHT AND DISCHARGE of South Saskatchewan river at Medicine Hat, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.	3.05 ^b	1,570	2.74	1,890	.....	4,250	3.41	7,081	3.73	7,782	8.60	30,380
2.	3.01	1,490	2.70	1,865	.....	3,790	3.47	7,207	4.00	8,460	9.25	35,085
3.	2.87	1,475	2.72	1,815	.....	3,660	3.12	6,508	4.06	8,622	9.45	36,575
4.	3.15	1,505	2.92	1,855	.....	3,490	3.24	6,740	3.66	7,618	8.70	31,090
5.	2.85	1,535	2.99	1,938	.....	3,115	3.67	7,641	4.02	8,514	8.79	31,734
6.	2.54	1,516	3.02	1,950	.....	2,920	3.51	7,291	4.61	10,211	9.38	36,051
7.	2.41	1,500	3.14	1,965	.....	2,835	3.45	7,165	4.86	11,008	10.04	41,174
8.	2.44	1,460	3.23	1,900	3.92	2,768	3.38	7,020	5.28	12,486	9.87	39,813
9.	2.42	1,430	3.36	1,910	.....	2,865	3.49	7,249	6.52	17,880	9.26	35,159
10.	2.46	1,400	3.28	1,985	.....	3,115	3.80	7,950	6.01	15,475	9.02	33,396
11.	2.45	1,425	3.17	2,080	6.35	3,430	3.96	8,356	5.78	14,476	9.37	35,977
12.	2.44	1,475	3.15	2,180	.....	3,910	3.99	8,434	5.36	12,788	9.57	37,482
13.	2.47	1,555	3.45	2,300	.....	4,410	4.02	8,514	5.32	12,636	9.54	37,254
14.	2.39	1,610	3.70	2,500	.....	5,050	4.12	8,784	4.73	10,586	9.03	33,469
15.	2.46	1,705	4.24	2,900	5.52	6,350	4.22	9,056	4.95	11,310	8.75	31,448
16.	2.58	1,780	4.79	4,300	5.01	7,100	3.88	8,150	4.98	11,412	8.90	32,525
17.	2.80	1,840	4.80	6,000	5.17	7,800	3.38	7,020	4.45	9,720	9.68	38,326
18.	2.97	1,885	7.35	12,500	5.21 ^b	8,650	3.84	8,304	4.15	8,865	11.30	51,555
19.	3.01	1,921	11.77	20,751	4.23	9,084	3.76	7,854	4.11	8,757	12.05	57,742
20.	3.03	1,945	9.60	12,300	4.10	8,730	3.44	7,144	4.39	9,541	12.75	63,517
21.	3.02	1,915	8.47	10,500	4.09	8,703	3.10	6,470	4.24	9,112	13.63	70,778
22.	2.96	1,845	8.66	9,500	4.23	9,084	3.22	6,700	4.32	9,338	13.88	72,840
23.	2.52	1,720	.....	8,800	3.93	8,278	3.34	6,940	4.55	10,025	14.47	77,708
24.	2.56	1,670	.....	8,000	3.90	8,200	2.98	6,242	5.13	11,938	13.42	69,045
25.	2.42	1,655	.....	7,200	3.81	7,975	3.31	6,880	5.10	11,830	11.56	53,700
26.	2.51	1,690	.....	6,200	3.98	8,408	3.36	6,980	5.28	12,486	11.15	50,317
27.	2.59	1,690	.....	5,650	3.98	8,408	2.98	6,242	5.64	13,894	10.77	47,183
28.	2.34	1,635	.....	5,250	4.26	9,168	2.98	6,242	6.24	16,528	10.90	48,255
29.	2.20	1,645	.....	4,700	3.68	7,664	3.12	6,508	6.52	17,880	12.02	57,495
30.	2.66	1,640	.....	.....	3.36	6,980	3.53	7,333	6.22	16,434	14.23	75,728
31.	2.74	1,790	.....	.....	3.41	7,081	.....	.....	6.82	19,416	.....	.....

^b Ice conditions from Jan. 1 to March 18. Discharge determined from winter hydrograph.

DAILY GAUGE HEIGHT AND DISCHARGE of South Saskatchewan river at Medicine Hat, for 1916
—Concluded

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	14.09	74,572	5.88	14,904	5.23	13,301	3.71	7,734	3.45	7,165	2.31	5,056
2....	12.76	63,600	5.56	13,570	5.26	12,412	3.61	7,503	.....	6,904e	2.48	5,336
3....	11.82	55,845	5.50	13,330	5.16	12,046	4.12	8,784	.....	6,642e	2.60	5,510
4....	12.16	58,650	5.23	12,301	5.46	13,174	.....	8,518e	.....	6,381e	2.46	5,302
5....	12.75	63,517	5.29	12,523	5.94	15,166	3.92	8,252	.....	6,119e	2.50b	4,750
6....	12.37	60,383	.....	12,675e	6.89	19,787	3.92	8,252	.....	5,858e	2.38	4,470
7....	11.53	53,453	5.37	12,826	8.68	30,948	3.89	8,175	.....	5,591e	2.30	4,270
8....	10.87	48,008	5.35	12,750	8.22	27,774	3.63	7,549	.....	5,335e	3.60	3,920
9....	10.25	42,892	5.28	12,486	7.48	23,112	3.53	7,333	.....	5,074e	3.68	3,700
10....	10.17	42,234	5.33	12,674	6.83	19,469	3.50	7,270	.....	4,813e	3.58	3,400
11....	10.35	43,717	5.34	12,712	6.06	15,700	3.57	7,417	.....	4,551e	3.56	3,170
12....	10.41	44,212	5.76	14,392	5.89	14,947	2.86	6,014	.....	4,290e	3.48	2,980
13....	10.24	42,810	6.54	17,980	5.76	14,392	4.12	8,784	.....	4,025e	3.37	2,830
14....	9.90	40,050	6.19	16,294	5.59	13,690	3.21	6,650	1.37	3,767	3.28	2,710
15....	9.68	38,326	5.64	13,894	4.98	11,412	3.30	6,860	2.27	4,992	3.13	2,650
16....	9.54	37,254	5.33	12,674	4.93	11,242	3.30	6,860	1.83	4,342	3.08	2,650
17....	9.32	35,604	5.06	11,690	5.34	12,712	3.25	6,760	2.58	5,506	3.00	2,730
18....	8.68	30,948	4.96	11,344	5.31	12,598	3.24	6,740	2.38	5,168	2.96	2,870
19....	8.64	30,664	5.14	11,974	5.21	12,227	3.24	6,740	2.40	5,200	3.04	3,010
20....	8.66	30,806	5.64	13,894	4.20	9,000	3.21	6,680	2.43	5,251	4.02	3,068
21....	8.64	30,664	9.80	39,260	4.46	9,750	3.50	7,270	3.33	6,920	4.08	3,070
22....	8.18	27,508	8.26	28,042	4.46	9,750	3.57	7,417	3.33	6,920	3.96	3,080
23....	7.60	24,830	7.29	22,003	4.40	9,570	3.43	7,123	2.86	6,014	4.08	3,000
24....	7.27	21,889	6.57	18,130	4.23	9,084	4.22	9,056	2.98	6,242	3.63	2,740
25....	7.18	21,378	6.31	16,858	4.15	8,865	3.43	7,123	2.78	5,864	3.63	2,600
26....	6.93	20,002	5.84	14,732	4.05	8,595	3.40	7,060	2.98	6,242	3.58	2,570
27....	6.73	18,946	6.41	17,339	3.94	8,304	3.57	7,417	2.98	6,242	3.50	2,710
28....	6.56	18,080	5.80	14,500	3.97	8,382	3.05	6,375	2.73	5,774	3.55	2,690
29....	6.27	16,669	5.82	14,646	3.71	7,734	4.69	10,459	2.46	5,302	3.49	2,380
30....	6.35	17,050	5.73	14,266	3.57	7,417	3.55	7,375	2.42	5,234	3.47	2,260
31....	6.12	15,972	5.53	13,450	.....	.....	3.45	7,165	.....	.....	2.93b	2,250

b Ice conditions, Dec. 5 to 31. Discharge determined from winter hydrograph.

e Discharge estimated.

MONTHLY DISCHARGE of South Saskatchewan river at Medicine Hat, for 1916

(Drainage area 20,870 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	1,945	1,400	1,641	0.079	0.09	100,901
February.....	23,751	1,815	5,265	0.252	0.27	302,847
March.....	9,168	2,768	6,041	0.289	0.33	371,446
April.....	9,056	6,242	7,334	0.351	0.39	436,406
May.....	19,416	7,618	11,840	0.567	0.65	728,012
June.....	77,708	30,380	46,427	2.220	2.48	2,762,593
July.....	74,572	15,972	37,727	1.810	2.09	2,319,743
August.....	39,260	11,344	15,490	0.742	0.86	952,443
September.....	30,948	7,417	13,419	0.643	0.72	798,487
October.....	10,459	6,375	7,508	0.360	0.42	461,648
November.....	7,165	3,767	5,591	0.268	0.30	332,688
December.....	5,540	2,250	3,347	0.160	0.18	205,799
The year.....	.....	.....	.....	.....	8.78	9,773,013

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of South Saskatchewan river at Medicine Hat

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October			6,065	5,873	7,600	7,112	7,508	6,832	420,063
November		4,228	5,099	4,647	5,556	4,537	5,591	4,943	294,132
December		2,501	2,376	3,117	2,251	2,378	3,347	2,662	163,661
January		1,663	1,652	2,547	2,305	1,641		1,962	120,613
February		2,134	2,013	1,576	1,982	5,265		2,594	146,998
March		1,792 _c	2,059	4,022	6,176	6,041		4,574	281,274
April		6,746 _b	8,977	5,754	5,345	7,334		6,852	407,753
May		12,887 _d	12,412	14,679	19,354	11,840		14,571	895,951
June	32,694	19,121	29,747	19,831	32,275	46,427		30,016	1,786,065
July	25,825	21,513	16,907	14,122	32,997	37,727		24,848	1,527,880
August	18,545 _a	13,292	12,260	6,590	18,470	15,490		13,220	812,893
September		8,698	7,592	4,486	8,815	13,419		8,602	511,837
Total in Acre-ft.	4,489,732	5,387,719	6,475,036	5,286,194	8,685,559	9,626,366			7,363,140

a 1-26.

b 10-19.

c 1-24 and 27.

d 3-31.

SOUTH SASKATCHEWAN RIVER AT SASKATOON

Location.—On SW. $\frac{1}{4}$ Sec. 28, Tp. 36, Rge. 5, W. 3rd Mer., at the Canadian Northern railway bridge in the city of Saskatoon.

Records available.—May 27, 1911, to December 31, 1916.

Gauge.—Chain. Elevation of zero maintained at 1,543.22 feet, since establishment.

Bench-marks.—Painted mark on side of downstream end of left abutment; elevation 1,568.98 referred to a bench-mark on top of hydrant three hundred feet northeast; elevation 1,586.94 feet (Geodetic survey datum) and to Geodetic B.M. No. 30 brass plug in south end Canadian Northern railway station; elevation 1,593.14 feet.

Channel.—Permanent.

Discharge measurements.—From bridge.

Observer.—A. B. Hay.

DISCHARGE MEASUREMENTS of South Saskatchewan river at Saskatoon, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 3, 4	F. R. Shenstone	493	2,039	1.52	5.32	3,089
Jan. 27, 28, 29, 31	do	623	1,614	1.20	4.78	1,937
Mar. 27	do				11.10	16,000 _e
Mar. 30	do				10.87	19,000 _e
April 10	do	785	8,548	2.73	12.05	23,374
May 23	do	532	4,254	3.08	6.29	13,134
June 15, 16	do	802	8,978	5.36	12.46	48,174
June 28	do	812	11,449	6.31	15.82	72,335
July 1	do	802	9,974	5.58	14.00	55,740
July 11	F. R. Shenstone and J. R. Estey	825	12,552	6.11	17.08	77,744
July 14	J. R. Estey	809	10,298	5.77	14.43	59,430
July 21	do	792	8,781	5.29	12.46	46,524
Aug. 4	do	747	6,268	4.41	9.20	27,657
Aug. 28	F. R. Shenstone	792	8,508	5.52	11.93	46,998
Sept. 19	do	752	6,568	4.78	9.38	31,405
Oct. 30-31	do	627	4,303	3.33	6.70	14,334
Nov. 21-22	do	450	2,792	1.70	4.56	4,764

e Estimated from field inspection.

DAILY GAUGE HEIGHT AND DISCHARGE of South Saskatchewan river at Saskatoon, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.	5.92 ^b	3,300	4.75	1,900	5.54	5,000	10.83	20,000	5.55	10,088	6.96	15,870
2.	5.55	3,200	4.75	2,000	5.95	6,800	10.89	20,000	5.46	9,795	7.19	16,976
3.	5.36	3,100	4.70	2,000	9.14	16,200	11.77	20,200	5.45	9,762	7.62	19,100
4.	5.24	3,100	4.71	2,000	9.70	17,600	12.12	20,300	5.17	8,852	8.19	22,096
5.	5.18	3,050	4.68	1,950	9.61	17,400	12.44	20,300	5.09	8,592	8.72	24,960
6.	5.17	3,050	4.67	1,900	9.39	17,200	12.31	20,400	5.10	8,625	12.92	49,780
7.	5.16	3,000	4.67	1,900	9.16	16,900	11.72	20,800	5.12	8,690	13.41	53,016
8.	5.15	3,000	4.65	1,900	8.73	16,500	11.30	21,000	5.39	9,568	12.90	49,650
9.	5.16	2,900	4.65	2,000	8.50	16,100	11.30	22,000	5.82	11,130	12.05	44,360
10.	5.18	2,850	4.61	2,000	8.34	15,600	12.20	22,500	6.02	11,930	12.44	46,660
11.	5.08	2,800	4.56	2,100	8.08	15,200	13.10	23,300	5.72	10,730	13.58	54,300 ^s
12.	4.99	2,750	4.51	2,100	7.70	14,900	13.22	23,700	5.88	11,370	13.74	55,700
13.	4.96	2,700	4.58	2,100	7.40	14,600	12.00	24,000	6.46	13,690	13.05	51,450
14.	4.84	2,650	4.50	2,200	7.16	14,200	10.30	30,000	6.95	15,825	12.56	48,500
15.	4.73	2,600	4.52	2,200	6.90	13,900	9.48 ^b	29,200	8.11	21,666	12.36	47,600
16.	4.66	2,550	4.55	2,200	6.75	13,500	11.20	39,200	8.17	21,989	12.62	49,200
17.	4.58	2,500	4.56	2,200	6.40	13,200	9.54	29,537	7.73	19,650	12.88	51,200
18.	4.40	2,450	4.55	2,200	6.33	13,200	8.98	26,390	7.75	19,750	12.32	47,700
19.	4.30	2,400	4.53	2,150	6.42	13,600	8.18	22,042	7.48	18,400	11.95	45,600
20.	4.27	2,350	4.54	2,200	6.83	14,000	7.48	18,400	7.21	17,074	11.85	45,175
21.	4.25	2,300	4.61	2,400	7.34	14,600	7.14	16,732	6.97	15,915	11.94	45,800
22.	4.25	2,250	4.66	2,700	8.96	15,000	6.90	15,600	6.74	14,880	13.36	55,200
23.	4.31	2,200	4.75	3,000	11.79	15,600	6.58	14,170	6.70	14,700	15.47	69,650
24.	4.41	2,150	4.75	3,100	11.52	16,300	5.58	10,185	6.27	12,930	17.08	80,700
25.	4.48	2,100	4.80	3,200	11.44	16,900	5.60	10,250	6.03	11,970	17.83	85,900
26.	4.64	2,000	4.86	3,400	11.40	17,400	6.36	13,090	6.18	12,570	18.38	89,800
27.	4.81	1,950	4.95	3,700	11.12	18,000	6.01	11,890	6.14	12,410	17.41	83,150
28.	4.80	1,950	5.08	4,000	10.73	18,400	5.87	11,330	6.20	12,650	15.72	71,800
29.	4.79	1,900	5.20	4,500	10.63	18,800	5.55	10,088	6.32	13,130	14.91	66,000
30.	4.76	1,900	.....	.....	10.83	19,000	5.59	10,218	6.43	13,570	.....	61,462 ^{se}
31.	4.75	1,900	.....	.....	10.79	20,000	.....	.....	6.94	15,780	.....	.....

^b Ice conditions from January 1 to April 14.^s Shifting conditions from June 11 to 30.^e Discharge estimated.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of South Saskatchewan river at Saskatoon,
for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	14.00	56,925	9.45	29,031	9.84	33,861	7.03	16,634	6.62	14,340	6.34	5,180
2....	14.03	57,123	9.25	27,906	9.56	32,139	7.03	16,634	6.55	14,050	6.94	5,230
3....	16.40	73,250	8.94	26,170	9.10	29,312	7.02	16,573	6.64	14,430	7.02	5,300
4....	19.30	93,042	8.97	25,335	8.94	28,332	6.79	15,295	6.50	13,850	7.03	5,370
5....	18.36	86,627	9.20	27,625	8.77	27,291	6.73	14,905	6.67	14,565	7.16	5,400
6....	16.63	74,820	9.05	26,781	8.45	25,331	6.74	15,020	6.76	14,970	7.37	5,460
7....	15.64	68,063	8.85	25,675	8.21	23,861	6.72	14,910	6.49	13,810	7.52	5,500
8....	16.07	70,998	8.47	23,601	8.11	23,249	6.77	15,185	6.48	13,775	7.75	5,540
9....	17.34	79,665	8.40	23,225	8.10	23,188	6.63	14,385	6.26b	11,700	7.91	5,590
10....	17.76	82,532	8.19	22,096	8.45	25,331	6.84	15,330	6.00	10,000	8.03	5,600
11....	16.71	75,366	8.18	22,042	11.00	40,995	6.76	14,970	5.29	8,800	8.46	5,600
12....	15.59	67,722	8.17	21,988	13.00	53,750	6.76	14,970	4.38	7,000	8.63	5,600
13....	14.85	62,671	8.12	21,720	12.55	50,775	6.71	14,745	4.15	6,100	8.70	5,500
14....	14.40	59,600	8.27	22,526	11.74	45,580	6.65	14,475	4.15	5,550	8.64	5,500
15....	14.36	59,330	8.24	22,365	11.16	41,979	6.50	13,850	4.17	5,380	8.61	5,350
16....	14.37	59,398	8.05	21,344	10.40	37,305	6.40	13,450	4.22	5,230	8.55	5,300
17....	13.91	56,329	7.99	21,021	9.91	34,292	6.52	13,930	4.45	5,100	8.40	5,200
18....	13.50	53,612	8.23	22,311	9.70	33,000	6.42	13,530	4.58	4,950	8.35	5,100
19....	13.15	51,294	8.66	24,630	9.41	31,216	6.50	13,850	4.63	4,850	8.35	5,000
20....	12.84	49,260	8.46	23,545	9.02	28,822	6.40	13,450	4.36	4,830	8.27	4,900
21....	12.41	46,465	8.06	21,397	8.58	26,128	6.10	12,250	4.48	4,760	.....	4,750e
22....	12.05	44,300	7.72	19,600	8.52	25,760	5.96	11,690	4.65	4,800	.....	4,670e
23....	11.59	41,540	7.40	18,000	8.57	26,067	5.95	11,650	4.21	4,820	.....	4,550e
24....	11.40	40,400	7.23	17,171	8.45	25,331	5.95	11,650	4.26	4,820	7.70	4,380
25....	11.36	40,160	7.32	17,610	8.14	23,432	5.98	11,770	4.36	4,830	.....	4,250e
26....	11.34	40,040	12.14	46,400s	7.61	20,186	6.08	12,170	4.60	4,860	7.72	4,200
27....	11.07	38,420	12.87	45,800s	7.58	20,003	6.20	12,650	4.84	4,900	7.78	4,090
28....	10.70	36,238	11.72	45,455	7.45	19,206	6.35	13,250	5.25	4,930	7.78	3,950
29....	10.30	33,888	11.09	41,548	7.34	18,532	6.50	13,850	5.19	4,980	7.75	3,900
30....	9.85	31,281	10.57	38,350	7.15	17,369	6.62	14,340	5.82	5,020	7.55	3,800
31....	9.70	30,437	9.97	34,660	.....	.....	6.72	14,790	.....	.....	7.60b	3,680

b Ice conditions November 9 to December 31.

s Shifting conditions from August 26-27.

e Discharge estimated.

MONTHLY DISCHARGE of South Saskatchewan river at Saskatoon, for 1916

(Drainage area 64,500^x square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	3,300	1,900	2,545	0.039	0.04	156,486
February.....	4,400	1,900	2,486	0.038	0.04	142,996
March.....	20,000	5,000	15,342	0.238	0.27	943,343
April.....	39,200	10,088	19,894	0.308	0.34	1,183,775
May.....	21,989	8,592	13,474	0.209	0.24	828,484
June.....	89,800	15,870	51,612	0.800	0.89	3,071,128
July.....	93,042	30,437	56,800	0.881	1.02	3,492,496
August.....	46,400	17,171	26,707	0.414	0.48	1,642,150
September.....	53,750	17,369	29,721	0.461	0.51	1,768,522
October.....	16,634	11,650	14,071	0.218	0.25	865,192
November.....	14,970	4,760	8,067	0.125	0.14	480,020
December.....	5,600	3,680	4,952	0.077	0.09	304,486
The year.....					4.31	14,879,078

^x The drainage area given in this table is only approximate. It must be remembered that the greater part of the run-off at this station is derived from the eastern slope of the Rocky mountains, and must not be used to base estimates of run-off of other streams in this territory.

MEAN MONTHLY DISCHARGE in Second-feet of South Saskatchewan river at Saskatoon

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
Oct.....		8,476 ^b	9,293	7,909	10,315	12,714	14,071	10,860	667,777
Nov.....		2,434 ^c	7,414	6,079	8,151	6,118	8,067	7,166	426,395
Dec.....		3,945	.....^d	3,752	3,204	3,855	4,952	3,942	240,871
Jan.....		1,686	1,247	2,702	3,379	2,545	.....	2,312	142,147
Feb.....		2,297	1,981	2,130	2,345	2,486	.....	2,248	126,733
March.....		2,304	2,432	3,038	3,318	15,342	.....	5,287	328,073
April.....		14,152	15,852	6,319	13,472	19,894	.....	13,938	829,361
May.....	22,688 ^a	14,737	11,937	13,876	19,813	13,474	.....	14,767	908,917
June.....	32,477	23,204	32,436	20,375	36,144	51,612	.....	33,708	2,005,767
July.....	27,684	33,602	24,232	22,694	60,566	56,800	.....	37,596	2,311,716
August.....	23,503	23,681	14,854	9,762	33,704	26,707	.....	22,035	1,354,902
Sept.....	20,357	16,359	9,143	7,945	16,357	20,721	.....	16,647	990,566
Total in Acre-ft.	6,471,251	8,617,256	7,903,464	6,809,595	12,798,628	14,612,214	.....	.....	10,329,325

a —28 to 31.

b —1 to 19.

c —20 to 30.

d —Not sufficient data to compute discharge for December.

BOW RIVER DRAINAGE BASIN

General Description

Bow river rises in lakes Bow and Hector, which are situated in the Rocky Mountains park, north of the main line of the Canadian Pacific railway and immediately east of the "Great Divide," the elevations of which lakes are respectively 6,420 and 5,694 feet above mean sea-level. The river flows in a south and easterly direction to the city of Calgary, where it takes a big bend to the south and then continues in a south and easterly direction to its confluence with the Oldman river at the "Grand Forks." Below this point the united stream is known as the South Saskatchewan river.

Bow river has a large number of tributaries in the western part of its course. Of these the principal are the Pipestone, Cascade and Ghost rivers draining the northern slopes of the basin, and the Spray, Kananaskis, Elbow, Sheep and Highwood rivers draining the southern slopes. Below the mouth of Highwood river very little drainage reaches Bow river, Crowfoot creek being the largest tributary, and so it appears that most of the water supply is derived from the run-off from mountains and foot-hills.

As a result, Bow river possesses a normally steady flow throughout the year, but is subject to sudden freshets caused by melting snow and heavy rains in the mountains.

The minimum flow occurs in the frozen season, when there is little run-off from the snow-fields in the western part of the drainage basin.

The valley of the Bow is deep and well defined throughout its course. In the mountain section it is comparatively narrow and is very heavily timbered, while its bed is stony and its banks high and rocky. The nature of the valley gradually changes as it approaches the prairies, when it widens out, becomes of a clay formation and is devoid of trees, the actual bed consisting for the most part of gravel. The water is clean and pure. A large quantity of water is diverted from the Bow river for irrigation purposes. The two chief users are the Department of Natural Resources, Canadian Pacific Railway company, and the Southern Alberta Land company.

The Department of Natural Resources diverts water at two points, one in the city of Calgary, and the other three miles southwest of Bassano. The first system has been in operation for several years and distributes water over the western section of the company's irrigation block, which extends east as far as Cluny. The works at Bassano comprise a very large earth-filled dam and concrete spillway, which were completed in 1913. This system is to serve the eastern section of the company's irrigation block, which extends east from Bassano. In all, it is proposed to irrigate about 625,000 acres of land.

The Southern Alberta Land company has a dam and reservoir near Namaka. It is proposed to irrigate by this system about 200,000 acres.

There are many favourable sites for power development on the Bow river, but only one company has, up to the present, developed power. The Calgary Power company has two plants, one at Kananaskis falls, at the confluence of the Kananaskis and Bow rivers, near Seebe station; the other at Horseshoe falls, two miles below. The latter plant has been in operation for several years and has, when sufficient water is available, a capacity of 19,500 horse-power. The dam at Kananaskis falls was completed in 1913, and this plant has a rated capacity of 11,600 horse-power. Nearly all the power developed is used by the city of Calgary.

The city of Calgary obtains most of its domestic water supply from the Elbow river. The intake is about twelve miles southwest of Calgary, above which point the course of the river is through a wild and unsettled country, where there is no possibility of human contamination.

The town of Bassano obtains its domestic water supply from the Bow river at the Canadian Pacific Railway company's dam, three miles southwest of the townsite.

A special report upon the floods in this drainage basin was published in an Appendix to the 1915 report.

BATH CREEK NEAR LAKE LOUISE

Location.—On the NE. $\frac{1}{4}$ Sec. 32, Tp. 28, Rge. 16, W. 5th Mer., and one and one-quarter miles west of Lake Louise station, near the mouth of the stream.

Records available.—May 25 to September 30, 1913. Discharge measurements only in 1914. May 23, 1915, to December 31, 1916.

Gauge.—Vertical staff. Elevation of zero maintained at 89.59 feet during 1913. Elevation of zero maintained at 90.54 feet during 1914-15-16.

Bench-mark.—Downstream corner of right concrete abutment; assumed elevation 100.00 feet.

Channel.—Gravel; shifting.

Discharge measurements.—Made by wading.

Observers.—D. Prescott, January 1 to March 11; J. Charyk, June 5 to December 31.

DISCHARGE MEASUREMENTS of Bath creek near Lake Louise, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 19.....	J. M. Paul.....	27.0	13.7	1.01	0.99	13.9
Feb. 15.....	H. C. Ritchie.....	28.0	12.8	0.84	0.95	10.7
Feb. 29.....	do.....	26.0	13.3	0.86	0.94	11.4
Mar. 14.....	do.....	26.5	14.0	0.90	0.95	12.7
Mar. 29.....	do.....	27.0	14.0	0.82	0.93	12.5
April 19.....	do.....	26.4	13.9	0.95	0.97	13.2
May 10.....	do.....	27.7	19.3	1.56	1.30	30.0
May 31.....	do.....	28.0	22.5	1.74	1.35	39.0
June 23.....	do.....	43.0	51.0	4.07	2.25	207.0
July 7.....	do.....	45.0	59.6	4.80	2.51	286.0
July 27.....	do.....	43.0	51.0	4.08	2.24	208.0
Aug. 15.....	do.....	42.0	54.2	4.12	2.30	223.0
Sept. 5.....	do.....	42.0	49.8	4.05	2.25	202.0
Oct. 3.....	do.....	29.4	24.0	1.97	1.44	47.0
Oct. 26.....	do.....	30.0	23.3	1.66	1.36	39.0
Nov. 17.....	do.....	27.0	18.0	1.26	1.15	23.0
Dec. 6.....	do.....	28.0	15.0	1.03	1.00	15.4

DAILY GAUGE HEIGHT AND DISCHARGE of Bath creek near Lake Louise, for 1916

DAY	January		February		March		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	1.05	17.8	0.98	14.8	0.94	13.4			2.68	346
2.....	1.05	17.8	0.98	14.8	0.94	13.4			2.70	353
3.....	1.05	17.8	0.98	14.8	0.94	13.4			2.72	360
4.....	1.04	17.3	0.98	14.8	0.95	14.1			2.74	367
5.....	1.03	16.8	0.98	14.8	0.96	14.1	1.49	48	2.67	343
6.....	1.03	16.8	0.98	14.8	0.94	13.4	1.42	41	2.61	322
7.....	1.03	16.8	0.96	14.1	0.94	13.4	1.43	42	2.47	275
8.....	1.03	16.8	0.96	14.1	0.94	13.4	1.45	44	2.65	336
9.....	1.02	16.4	0.96	14.1	0.94	13.4	1.49	48	2.89	418
10.....	1.02	16.4	0.96	14.1	0.94	13.4	1.44	43	2.98	448
11.....	1.02	16.4	0.96	14.1	0.97	14.4	1.45	44	3.01	458
12.....	1.00	15.5	0.96	14.1			1.51	50	3.03	465
13.....	1.00	15.5	0.96	14.1			1.55	54	3.29	554
14.....	1.00	15.5	0.94	13.4			1.65	66	2.97	445
15.....	1.00	15.5	0.96	14.1			1.90	109	2.75	370
16.....	0.98	14.8	0.98	14.8			2.11	162	2.80	387
17.....	0.97	14.4	1.00	15.5			2.18	183	2.82	394
18.....	0.97	14.4	1.00	15.5			2.95	438	2.98	448
19.....	0.99	15.2	0.98	14.8			3.31	560	2.73	363
20.....	0.99	15.2	0.95	13.8			3.51	628	2.51	288
21.....	0.99	15.2	0.95	13.8			2.96	441	2.43	261
22.....	0.90	12.0	0.97	14.4			2.73	363	2.45	268
23.....	0.99	15.2	0.97	14.4			2.44	285	2.37	241
24.....	1.02	16.4	0.97	14.4			2.50	285	2.29	216
25.....	1.00	15.5	0.97	14.4			2.69	350	2.26	207
26.....	1.00	15.5	0.97	14.4			2.73	363	2.23	198
27.....	1.00	15.5	0.97	14.4			2.86	407	2.21	192
28.....	1.00	15.5	0.98	14.8			2.93	431	2.21	192
29.....	1.00	15.5	0.94	13.4			2.86	407	2.22	195
30.....	1.00	15.5					2.70	353	2.37	241
31.....	1.00	15.5							2.30	219

No observer March 12 to June 4.

SESSIONAL PAPER No. 25a

DAILY GAUGE HEIGHT AND DISCHARGE OF Bath creek near Lake Louise, for 1916—*Concluded.*

DAY	August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	2.34	232	2.56	305	1.49	48	1.34	35.0	1.10	20.0
2.....	2.34	232	2.53	295	1.47	46	1.32	33.0	1.12	21.0
3.....	2.51	288	2.46	271	1.44	43	1.22	27.0	1.12	21.0
4.....	2.47	275	2.43	261	1.27	30	1.31	32.0	1.11	21.0
5.....	2.31	222	2.45	268	1.35	36	1.23	27.0	1.11	21.0
6.....	2.28	213	2.23	198	1.41	40	1.22	27.0	1.00	15.5
7.....	2.25	204	2.16	177	1.39	39	1.03	16.8	1.06	18.2
8.....	2.29	216	2.06	148	1.36	36	1.17	24.0	1.06	18.2
9.....	2.35	235	2.03	140	1.36	36	1.17	24.0	1.07	18.6
10.....	2.33	229	1.93	116	1.35	36	1.12	21.0	1.03	16.8
11.....	2.27	210	1.90	107	1.35	36	1.00	15.5	1.04	17.3
12.....	2.21	192	1.89	109	1.34	35	1.02	16.4	1.06	18.2
13.....	2.20	189	1.81	91	1.34	35	1.12	21.0	1.06	18.2
14.....	2.23	198	1.76	83	1.36	36	1.10	20.0	1.05	17.8
15.....	2.30	219	1.75	81	1.37	37	1.10	20.0	1.05	17.8
16.....	2.31	222	1.73	78	1.96	123	1.16	23.0	1.05	17.8
17.....	2.22	195	1.74	79	2.06	148	1.13	23.0	1.03	16.8
18.....	2.17	180	1.73	78	1.72	76	1.15	23.0	1.01	16.0
19.....	2.20	189	1.72	76	1.63	64	1.14	22.0	1.05	17.8
20.....	2.16	177	1.71	75	1.46	45	1.13	22.0	1.04	17.3
21.....	2.01	135	1.71	75	1.45	44	1.11	21.0	1.01	16.0
22.....	1.95	120	1.73	78	1.42	41	1.15	23.0	1.00	15.5
23.....	2.03	140	1.72	76	1.41	40	1.12	21.0	1.00	15.5
24.....	2.20	189	1.74	79	1.39	39	1.10	20.0	0.99	15.2
25.....	2.17	180	1.75	81	1.38	38	1.13	22.0	0.98	14.8
26.....	2.21	192	1.68	70	1.39	39	1.13	22.0	1.00	15.5
27.....	2.21	192	1.51	50	1.37	37	1.15	23.0	0.97	14.4
28.....	2.23	198	1.55	54	1.30	32	1.14	22.0	0.98	14.8
29.....	2.22	195	1.54	53	1.29	31	1.12	21.0	0.94	13.4
30.....	2.27	210	1.56	55	1.29	31	1.10	20.0	0.98	14.8
31.....	2.61	322	.....	.....	1.36	36	.....	.....	0.96	14.1

MONTHLY DISCHARGE OF Bath creek near Lake Louise, for 1916

(Drainage area 31 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	17.8	12.0	26.0	0.839	0.97	1,599
February.....	15.5	13.4	14.4	0.464	0.50	828
March (1-11).....	14.4	13.4	13.6	0.439	0.18	297
April.....	.....	.....	.....	.....	.....	.....
May.....	.....	.....	.....	.....	.....	.....
June (5-30).....	628.0	41.0	239.0	7.710	7.46	12,325
July.....	554.0	192.0	328.0	10.581	12.20	20,168
August.....	322.0	120.0	206.0	6.645	7.66	12,666
September.....	305.0	50.0	124.0	4.000	4.46	7,379
October.....	148.0	30.0	46.0	1.484	1.71	2,828
November.....	35.0	15.5	23.0	0.742	0.83	1,369
December.....	21.0	13.4	17.1	0.552	0.64	1,051
The period.....	.....	.....	.....	.....	36.61	60,510

BOW RIVER NEAR LAKE LOUISE

Location.—On the SE. $\frac{1}{4}$ Sec. 28, Tp. 28, Rge. 16, W. 5th Mer., one-half mile east of Lake Louise station, at the confluence of the Bow and Pipestone rivers.

Records available.—January 1, 1911, to December 31, 1916. In 1910 discharge measurements were obtained.

Gauge.—Chain; elevation of zero maintained at 4,931.72 feet since establishment.

Bench-mark.—Permanent iron bench-mark on the left bank; elevation 4,942.82 feet above mean sea-level (Canadian Pacific railway datum).

Channel.—Permanent.

Discharge measurements.—Made from a cable or by wading.

Floods.—The highest gauge height recorded was 9.54 feet on June 26, 1915. Stream did not overflow banks.

Observer.—E. Braund.

DISCHARGE MEASUREMENTS of Bow river near Lake Louise, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 19.....	J. M. Paul.....	32.0	31.0	1.65	5.21	51
Jan. 19.....	do.....	37.0	28.7	2.03	5.21	58
Feb. 15.....	H. C. Ritchie.....	48.0	35.0	1.66	6.64	58
Feb. 29.....	do.....	48.0	32.0	1.54	4.85	49
Mar. 14.....	do.....	48.0	38.3	1.89	7.02	72
Mar. 28.....	do.....	48.0	38.8	1.92	4.60	75
April 18.....	do.....	50.0	35.0	1.67	4.25	58
May 9.....	do.....	55.0	92.0	2.12	5.53	195
May 30.....	do.....	63.0	118.0	2.68	5.89	317
June 27.....	do.....	76.0	320.0	6.65	8.80	2,128
July 6.....	do.....	74.5	235.5	5.16	7.67	1,215
Aug. 15.....	do.....	73.0	188.7	5.10	7.12	962
Sept. 4.....	do.....	73.0	214.0	4.93	7.38	1,053
Oct. 2.....	do.....	60.0	75.2	2.53	5.45	190
Oct. 26.....	do.....	55.0	69.5	2.55	5.40	177
Nov. 17.....	do.....	50.0	46.0	2.01	6.30	92
Dec. 6.....	do.....	51.0	44.9	1.77	6.13	80

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Bow river near Lake Louise, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	5.66b	79	5.13	52	4.80	49	4.31	68	4.76	89	5.90	299
2....	5.40	77	4.95	52	4.72	49	4.28	66	4.84	97	5.89	296
3....	5.47	77	4.80	53	4.64	50	4.25	65	5.08	130	5.89	296
4....	5.57	77	4.80	52	4.70	51	4.27	65	5.44	187	5.85	284
5....	5.42	76	4.80	52	4.98	51	4.27a	64	5.74	253	6.03	354
6....	5.40	75	4.76	51	4.79	51	4.27a	64	5.84	281	6.10	368
7....	5.36	73	4.54	51	4.73	51	4.25a	64	5.81	281	6.01	346
8....	5.30	72	4.73	52	4.81	52	4.24a	64	5.65	230	6.10	368
9....	5.27	71	4.71	52	4.99	54	4.23a	63	5.51	200	6.20	406
10....	5.27	69	4.72	52	5.38	57	4.22a	62	5.46	191	6.24	422
11....	5.37	67	4.72	53	6.59	60	4.21a	61	5.25	156	6.16	391
12....	5.18	66	4.63	54	7.16	64	4.20a	61	5.22	151	6.25	426
13....	5.07	64	6.58	56	6.96	68	4.20a	60	5.18	145	6.40	489
14....	4.99	63	6.89	57	6.82a	72	4.20a	59	5.25	156	6.57	572
15....	5.04	61	6.64	58	6.70a	86	4.20a	59	5.22	151	7.03	872
16....	5.04	60	6.83	58	6.68a	90	4.19a	59	5.44	187	7.79	1,432
17....	5.19	60	7.30	58	6.50a	92	4.18ab	58	5.49	196	8.52	2,128
18....	5.22	59	7.17	58	6.20a	91	4.16	55	5.66	232	9.07	2,666
19....	5.20	58	7.36	56	6.07	91	4.16	55	5.77	261	10.26	3,832
20....	5.23	58	6.46	55	5.96	86	4.16	55	5.83	278	9.75	3,332
21....	5.23	58	6.28	54	5.84	83	4.14	55	5.77	261	9.31	2,901
22....	5.23	58	6.12	53	5.93	82	4.14	55	5.68	237	8.77	2,372
23....	5.24	59	6.00	53	6.51	80	4.25	57	5.66	232	8.39	2,002
24....	5.34	60	5.96	52	6.15	78	4.24	57	5.64	228	8.26	1,876
25....	5.21	59	5.51	51	5.99	76	4.24	57	5.63	225	8.34	1,954
26....	5.10	57	4.73	50	4.47	76	4.35	59	5.70	212	8.54	2,148
27....	5.13	53	4.54	49	4.42	76	4.49	64	5.81	242	8.79	2,391
28....	5.13a	51	4.51	49	4.60	75	4.63	76	5.97	322	8.78	2,381
29....	5.13a	50	4.47	49	4.51	75	4.55	69	5.88	293	8.89	2,489
30....	5.13a	50	.....	.....	4.63	74	4.53	67	5.91	302	8.37	1,983
31....	5.13a	51	.....	.....	4.45	70	.....	.....	5.92	306	.....	.....

a Gauge heights interpolated.

b Ice conditions January 1 to April 17.

DAILY GAUGE HEIGHT AND DISCHARGE of Bow river near Lake Louise, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	8.14	1,750	7.23	991	7.36	1,085	5.51	200	5.23	152	7.14	97
2....	8.13	1,760	7.33	1,063	7.36	1,085	5.46	191	5.30	163	6.79	95
3....	8.32	1,934	7.53	1,216	7.45	1,154	5.38	177	5.21	150	6.71	91
4....	8.24	1,857	7.24	998	7.38	1,100	5.30	163	5.24	154	6.38	87
5....	8.11	1,731	7.09	893	7.31	1,048	5.28	160	5.22	151	6.24	83
6....	7.68	1,339	7.04	859	7.06	872	5.28	160	5.19	146	6.08	80
7....	7.80	1,440	7.07	879	6.78	693	5.20	148	5.00	118	6.20	79
8....	7.36	1,085	7.18	956	6.78	693	5.20	148	5.11	134	6.14	78
9....	8.77	2,372	7.39	1,108	6.66	622	5.16	142	5.13	138	5.97	76
10....	8.76	2,362	7.21	977	6.43	503	5.15	140	4.91	105	6.01	75
11....	8.68	2,284	7.03	852	6.30	446	5.13	138	4.69	81	5.98	73
12....	8.89	2,489	6.93	786	6.26	430	5.12	136	4.66 ^b	83	5.78	71
13....	9.19	2,783	6.93	786	6.17	395	5.11	134	4.80	86	5.67	69
14....	8.59	2,196	7.02	845	6.05	350	5.15	140	4.90	88	5.54	69
15....	8.08	1,702	7.12	914	5.96	319	5.20	148	5.15	89	5.49	68
16....	8.11	1,731	7.04	859	5.90	299	5.71	245	5.78	91	5.53	67
17....	8.43	2,041	6.92	779	5.88	293	6.14	383	6.30	92	5.44	67
18....	8.36	1,973	6.85	736	5.88	293	5.91	302	6.80	94	5.60	66
19....	8.02	1,643	6.63	605	5.88	293	5.82	275	6.95	96	5.51	66
20....	7.72	1,373	6.44	508	5.84	281	5.70	242	7.22	99	5.48	66
21....	7.43	1,138	6.28	438	5.79	266	5.63	225	7.22	100	5.46	65
22....	7.26	1,013	6.33	450	5.79	266	5.55	208	7.22	101	5.48	65
23....	7.05	866	6.59	583	5.84	281	5.47	193	7.24	101	5.48	64
24....	6.84	729	6.84	729	5.84	281	5.41	182	7.33	101	5.48	64
25....	7.09	893	6.90	766	5.93	309	5.39	178	7.33	101	5.43	64
26....	7.19	963	6.91	772	5.81	272	5.40	180	7.38	101	5.13	63
27....	7.25	1,006	6.96	805	5.59	216	5.37	175	7.31	100	5.24 ^a	60
28....	7.16	942	6.95	798	5.59	216	5.26	157	7.30	98	5.36 ^a	57
29....	6.97	812	6.98	818	5.54	206	5.23	152	7.30	97	5.47	57
30....	6.94	792	7.01	838	5.59	216	5.22	152	7.17	97	5.68	60
31....	7.08	886	7.57	1,249	.....	.....	5.24	154	.....	.....	5.42 ^b	62

^a Gauge height interpolated.^b Ice conditions November 12 to December 31.

MONTHLY DISCHARGE of Bow river near Lake Louise, for 1916

(Drainage area 159 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	79	50	63	0.396	0.46	3,874
February.....	58	49	53	0.333	0.36	3,049
March.....	92	49	70	0.440	0.51	4,304
April.....	76	55	61	0.384	0.43	3,630
May.....	322	89	218	1.371	1.58	13,404
June.....	3,832	284	1,403	8.824	9.84	83,324
July.....	2,783	729	1,545	9.717	11.20	94,998
August.....	1,249	438	834	5.245	6.05	51,281
September.....	1,154	206	492	3.094	3.45	29,276
October.....	383	134	185	1.164	1.34	11,375
November.....	163	81	110	0.692	0.77	6,545
December.....	97	57	71	0.447	0.52	4,366
The year.....	.....	.....	.....	.....	36.51	309,426

SESSIONAL PAPER No. 25B

MEAN MONTHLY DISCHARGE in Second-feet of Bow river near Lake Louise

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		108	145	199	194	162	185	165	10,171
November.....		72a	95	100	99	106	110	102	6,067
December.....			88	77	60	93	71	78	4,791
January.....			44	62	50	63		61	3,353
February.....		58	49	52	46	53		52	2,941
March.....		58	42	44	55	45		52	3,218
April.....		99	55	81	59	144		83	4,950
May.....		317	325	389	373	355		330	20,258
June.....	1,403	1,015	1,368	1,013	796	1,403		1,166	69,373
July.....	1,309	1,022	1,090	1,725	1,107	1,545		1,300	79,712
August.....	897	1,147	1,005	906	1,223	834		1,002	61,615
September.....	485	351	559	405	483	492		462	27,524
Total in Acre-feet	286,140	251,507	299,924	305,584	279,690	309,126			293,973

a 1-9.

PIPESTONE RIVER NEAR LAKE LOUISE

Location.—On the SW. $\frac{1}{4}$ Sec. 27, Tp. 28, Rge. 16, W. 5th Mer., one-half mile east of Lake Louise station, at the confluence of the Bow and Pipestone rivers.

Records available.—September 1, 1911, to October 31, 1911; January 1, 1912, to December 31, 1916.

Gauge.—Chain: Elevation of zero maintained at 4,985.04 feet since establishment.

Bench-mark.—Permanent iron bench-mark on left bank, elevation 4,993.73 feet above mean sea-level (Canadian Pacific Railway datum).

Channel.—Small boulders and gravel. High water may shift boulders.

Discharge measurements.—Made from cable or by wading.

Floods.—Stream was in flood during June, 1916. Maximum gauge height 7.73 feet; stream did not overflow banks.

Observer.—E. Braund.

DISCHARGE MEASUREMENTS of Pipestone river near Lake Louise, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 19.....	J. M. Paul.....	43.0	17.8	1.31	4.43	23
Feb. 15.....	H. C. Ritchie.....	35.0	22.5	1.00	4.20	22
Mar. 1.....	do.....	37.0	24.0	1.02	4.20	24
Mar. 14.....	do.....	35.0	16.0	1.59	5.20	26
Mar. 28.....	do.....	37.0	31.0	1.10	4.03	33
April 18.....	do.....	43.0	30.0	0.84	3.93	25
May 9.....	do.....	58.0	57.0	1.79	4.53	102
May 30.....	do.....	65.0	72.0	2.62	4.85	190
June 27.....	do.....	82.0	230.0	6.71	6.84	1,545
June 27.....	do.....	82.0	230.0	6.71	6.84	1,545x
July 6.....	do.....	78.0	159.0	4.56	5.94	723
July 27.....	do.....	77.0	159.0	4.19	5.79	581
Aug. 15.....	do.....	75.0	127.0	3.74	5.54	476
Sept. 4.....	do.....	77.0	136.0	4.02	5.75	547
Oct. 2.....	do.....	63.0	58.0	1.88	4.76	109
Oct. 26.....	do.....	63.0	61.0	1.92	4.71	117
Dec. 7.....	do.....	46.0	34.0	1.03	5.00	34
Dec. 30.....	W. K. Broughton.....	25.0	11.8	3.06	4.86	36

x Slope measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Pipestone river near Lake Louise, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	4.52b	24	4.36	24	4.24	24	3.92	25	4.21	51	4.85	187
2....	4.46	24	4.34	24	4.25	24	3.89	23	4.26	58	4.84	184
3....	4.47	24	4.27	24	4.28	24	3.93	26	4.51	98	4.78	166
4....	4.36	24	4.25	23	4.26	24	3.88	23	4.62	123	4.76	160
5....	4.35	24	4.23	23	4.25	24	3.91	25	4.85	187	4.97	226
6....	4.37	24	4.23	24	4.25	24	3.84	20	4.91	206	5.01	241
7....	4.37	23	4.23	24	4.24	24	3.84	20	4.89	199	4.96	223
8....	4.38	23	4.23	24	4.23	24	3.94	27	4.75	158	5.00	237
9....	4.38	23	4.26	24	4.24	24	3.93	26	4.51	98	5.15	296
10....	4.38	23	4.26	23	4.28	25	3.93	26	4.44	85	5.13	287
11....	4.39	23	4.20	23	4.84	25	3.89	23	4.36	72	5.06	260
12....	4.39	23	4.21a	22	5.34	26	3.87	22	4.31	64	5.14	291
13....	4.40	23	4.23a	22	4.93	26	3.93	26	4.33	68	5.26	342
14....	4.40	23	4.22a	22	5.20	26	3.93	26	4.39	76	5.38	397
15....	4.40	23	4.22	22	5.05	26	3.94	27	4.34	69	5.67	549
16....	4.39	23	4.22	24	4.84	27	3.88	23	4.55	107	6.17	919
17....	4.41	23	4.73	28	4.32	28	3.84	20	4.58	114	6.63	1,350
18....	4.41	23	4.69	28	5.26	28	3.90	24	4.78	166	6.91	1,613
19....	4.42	23	4.44	25	4.13	29	3.92	25	4.83	181	7.73	2,384
20....	4.42	23	4.43	25	4.18	30	3.89	23	4.87	193	7.26	1,942
21....	4.40	23	4.39	24	4.05	30	3.84	20	4.83	181	6.93	1,632
22....	4.40	23	4.42	24	4.16	30	3.75	16	4.83	181	6.47	1,200
23....	4.37	23	4.34	24	3.98	31	3.91	25	4.67	136	6.24	984
24....	4.39	23	4.29	24	4.00	32	3.96	28	4.64	128	6.17	919
25....	4.38	23	4.24	24	3.92	32	4.04	35	4.61	120	6.30	1,040
26....	4.38	23	4.30	24	3.97	32	4.05	36	4.64	128	6.39	1,125
27....	4.39	23	4.32	24	3.92	33	4.10	40	4.83	181	6.68	1,397
28....	4.43	23	4.35	24	3.92	33	4.26	58	4.94	216	6.58	1,303
29....	4.46	24	4.26	24	3.93	32	4.14	44	4.82	178	6.77	1,482
30....	4.46	25	.....	.....	3.98	30	4.03	34	4.84	184	6.48	1,209
31....	4.42	25	.....	.....	3.93b	26	.....	.....	4.87	193	.....	.....

a Gauge height interpolated.

b Ice conditions, January 1 to March 31.

SESSIONAL PAPER No. 25a

DAILY GAUGE HEIGHT AND DISCHARGE of Pipestone river near Lake Louise, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	6.25	993	5.68	528	5.50	420	4.77	123	4.66	93	5.64	42
2....	6.32	1,059	5.68	530	5.46	400	4.76	120	4.68	98	5.60	41
3....	6.39	1,125	5.77	582	5.73	538	4.73	111	4.57	73	5.43	40
4....	6.22	965	5.53	454	5.75	548s	4.50	58	4.65	91	5.29	38
5....	6.37	1,106	5.47	425	5.65	492	4.69	101	4.62	84	5.24	36
6....	5.88	681s	5.46	421	5.46	391	4.70	103	4.56	71	5.03	35
7....	6.00	766	5.49	438	5.34	333	4.63	86	4.47	53	5.08	34
8....	6.43	1,062	5.57	481	5.31	319	4.67	96	4.58	75	5.04	34
9....	6.60	1,312	5.69	550	5.25	306	4.59	77	4.62	84	4.92	34
10....	6.51	1,224	5.54	468	5.20	272	4.62	84	4.55	68	4.83	34
11....	6.40	1,120	5.43	413	5.15	252	4.66	93	4.44	48	4.79	33
12....	6.57	1,272	5.38	392	5.15	252	4.64	89	4.51b	48	4.79	33
13....	6.86	1,540	5.38	394	5.08	224	4.64	89	4.55	47	4.74	32
14....	6.13	858	5.47	437	5.05	212	4.68	98	4.76	46	4.48	31
15....	5.84	640	5.50	454	5.03	205	4.68	98	5.14	46	4.44	30
16....	6.05	790	5.47	436	5.01	198	4.89	158	5.32	45	4.29	31
17....	6.21	923	5.37	388	4.99	191	5.18	264	5.48	45	4.78	32
18....	6.08	807	5.37	384	4.97	184	4.90	161	5.67	45	4.83	31
19....	5.87	648	5.26	333	4.97	184	4.97	184	5.57	46	4.79	36
20....	5.76	580	5.18	297	4.94	174	4.88	155	5.57	46	4.72	36
21....	5.58	475	5.09	260	4.91	164	4.80	131	5.57	46	4.78	36
22....	5.51	440	5.16	286	4.89	158	4.77	123	5.63	45	4.83	36
23....	5.43	398	5.39	384	4.89	158	4.74	114	5.65	45	4.77	36
24....	5.38	372	5.47	420	4.86	149	4.70	103	5.66	45	4.83	36
25....	5.58	468	5.48	423	4.96	181	4.70	103	5.66	44	4.83	36
26....	5.70	534	5.39	380	4.87	152	4.70	103	5.69	44	4.83	36
27....	5.78	580	5.39	378	4.82	137	4.70	103	5.71	44	4.93	36
28....	5.71	540	5.36	362	4.87	152	4.57	73	5.67	44	4.82a	36
29....	5.50	428	5.35	356	4.77	123	4.66	93	5.67	44	4.72	36
30....	5.48	420	5.37	363	4.72	109	4.66	93	5.59	43	4.85	36
31....	5.57	468	5.76	561	.....	.....	4.67	96	.....	.....	4.93b	36

a Gauge height interpolated.

b Ice conditions from November 12 to December 31.

s Shifting conditions from July 6 to September 4.

MONTHLY DISCHARGE of Pipestone river near Lake Louise, for 1916

(Drainage area 136 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	25	23	23	0.169	0.19	1,414
February.....	28	22	24	0.176	0.19	1,380
March.....	33	24	28	0.206	0.24	1,722
April.....	58	16	27	0.198	0.22	1,607
May.....	216	51	135	0.993	1.14	8,301
June.....	2,384	160	818	6.010	6.70	48,674
July.....	1,540	372	793	5.830	6.72	48,760
August.....	582	260	419	3.080	3.55	25,783
September.....	548	109	253	1.860	2.08	15,055
October.....	264	58	112	0.824	0.95	6,887
November.....	98	43	57	0.420	0.47	3,392
December.....	42	30	35	0.257	0.30	2,152
The year.....	.....	.....	.....	.....	22.75	165,107

MEAN MONTHLY DISCHARGE in Second-feet of Pipestone river near Lake Louise

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		90	101	127	151	118	112	116	7,160
November			145	63	60	71	57	79	4,707
December			96	52	36	33	35	50	3,095
January		31 ^a	43	39	42	23		37	2,260
February		26	38	28	27	24		29	1,614
March		14	29	29	34	28		27	1,646
April		13	55	37	94	27		45	2,805
May		265	245	291	241	135		235	14,471
June		558	748	683	475	818		656	39,053
July		468	533	640	577	793		602	37,029
August		511	457	293	484	419		433	26,608
September		200	225	292	170	253		222	13,176
Total in Acre-feet.	11,901	132,754	168,372	148,680	146,359	166,186			153,624

^a 24-31

LOUISE CREEK NEAR LAKE LOUISE

Location.—On the NE. $\frac{1}{4}$ Sec. 20, Tp. 28, Rge. 16, W. 5th Mer., at the Chateau Lake Louise, five hundred feet below the lake.

Records available.—July 11, 1913, to December 31, 1916.

Gauge.—Vertical staff. Zero elevation maintained at 93.72 feet since establishment to June 9, 1915. Zero elevation maintained at 90.63 feet from June 9, 1915, to December 31, 1916.

Bench-mark.—Spikes in tree on left bank about fifteen feet below gauge; assumed elevation 100.00 feet.

Channel.—Permanent.

Discharge measurements.—Made by wading.

Diversions.—The penstock of the Lake Louise power plant takes water from the lake and this quantity must be added to the discharge of Louise creek to obtain the total run-off from the lake.

Observer.—J. Talerico.

DISCHARGE MEASUREMENTS of Louise creek near Lake Louise, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 20	J. M. Paul				3.80	1.40 ^e
Mar. 28	H. C. Ritchie				3.49	0.33 ^e
May 9	do				4.00	1.00 ^e
May 30	do	17.7	12.14	0.61	4.08	7.30
June 23	do	20.0	19.20	3.31	4.69	64.00
July 6	do	20.0	19.20	3.06	4.65	59.00
July 27	do	22.0	21.25	3.50	4.72	74.00
Aug. 15	do	22.0	25.25	3.22	4.81	81.00
Sept. 5	do	22.0	22.90	2.85	4.74	66.00
Oct. 2	do	14.7	7.12	1.55	4.16	11.00
Oct. 26	do	16.0	8.40	1.66	4.22	14.00
Nov. 17	do	14.0	5.25	0.89	4.16	4.70
Dec. 29	W. K. Broughton	11.0	2.85	0.38	3.93	1.07

^e Discharge estimated by personal observation of the District Engineer, and was composed of seepage, through the dam, which was being constructed to raise the level of Lake Louise.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Louise creek near Lake Louise, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.	3.70 ^b	0.70	3.63	0.48	3.64	0.51	3.65	0.54	3.78	1.26	4.10	8.2
2.	3.70	0.70	3.62	0.45	3.64	0.51	3.65	0.54	3.80	1.40	4.10	8.2
3.	3.70	0.70	3.55	0.36	3.66	0.58	3.66	0.58	3.83	1.82	4.09	7.9
4.	3.70	0.70	3.55	0.36	3.69	0.67	3.66 ^b	0.58	3.89	2.70	4.10	8.2
5.	3.70	0.70	3.52	0.35	3.71	0.77	3.66	0.58	3.90	2.80	4.10	8.2
6.	3.70	0.70	3.52	0.35	3.72	0.84	3.66	0.58	3.91	3.00	4.10	8.2
7.	3.70	0.70	3.52	0.35	3.74	0.98	3.66	0.58	3.92	3.20	4.09	7.9
8.	3.70	0.70	3.52	0.35	3.75	1.05	3.66	0.58	3.97	4.30	4.18	11.9
9.	3.70	0.70	3.52	0.35	3.64	0.51	3.66	0.58	4.00	5.00	4.30	19.4
10.	3.70	0.70	3.52	0.35	3.64	0.51	3.66	0.58	4.00	5.00	4.22	14.1
11.	3.70	0.70	3.52	0.35	3.63	0.48	3.66	0.58	4.08	7.60	4.23	14.8
12.	3.67	0.61	3.51	0.34	3.63	0.48	3.66	0.58	4.07	7.20	4.18	11.9
13.	3.67	0.61	3.51	0.34	3.62	0.45	3.66	0.58	4.04	6.30	4.18	11.9
14.	3.67	0.61	3.51	0.34	3.62	0.45	3.66	0.58	3.97	4.30	4.24	15.4
15.	3.66	0.58	3.50	0.34	3.54	0.36	3.66	0.58	3.95	3.90	4.30	19.4
16.	3.66	0.58	3.50	0.34	3.54	0.36	3.66	0.58	3.94	3.70	4.55	46.0
17.	3.66	0.58	3.50	0.34	3.53	0.36	3.65	0.54	3.94	3.70	4.60	52.0
18.	3.66	0.58	3.50	0.34	3.53	0.36	3.65	0.54	3.94	3.70	4.65	59.0
19.	3.66	0.58	3.50	0.34	3.53	0.36	3.66	0.58	3.93	3.40	4.66 ^a	60.0
20.	3.80	1.40	3.50	0.34	3.53	0.36	3.66	0.58	3.91	3.00	4.67 ^a	62.0
21.	3.80	1.40	3.49	0.34	3.53	0.36	3.66	0.58	3.91	3.00	4.68 ^a	63.0
22.	3.80	1.40	3.49	0.34	3.55	0.36	3.66	0.58	3.91	3.00	4.69 ^a	65.0
23.	3.80	1.40	3.48	0.33	3.54	0.36	3.66	0.58	3.94	3.70	4.69	65.0
24.	3.80	1.40	3.48	0.33	3.54	0.36	3.66	0.58	3.98	4.60	4.70	66.0
25.	3.70	0.70	3.46	0.32	3.53	0.36	3.66	0.58	3.98	4.60	4.70	66.0
26.	3.70	0.70	3.46	0.32	3.53	0.36	3.66	0.58	4.00	5.00	4.72	69.0
27.	3.70	0.70	3.45	0.32	3.53	0.36	3.66	0.58	4.00	5.00	4.72	69.0
28.	3.70	0.70	3.44	0.31	3.53	0.36	3.66	0.58	4.00	5.00	4.72	69.0
29.	3.70	0.70	3.43	0.30	3.53	0.36	3.66	0.58	4.08	7.60	4.72	69.0
30.	3.70	0.70	.....	.....	3.53	0.36	3.67	0.61	4.08	7.60	4.71	67.0
31.	3.70	0.70	.....	.....	3.53	0.36	.....	.....	4.10	8.20	.....	.....

^a Gauge height interpolated.^b Ice conditions January 1 to April 4

DAILY GAUGE HEIGHT AND DISCHARGE of Louise creek near Lake Louise, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	4.71	67	4.79	79	4.84	86.0	4.16	11.0	4.18	11.9	4.03	3.00
2....	4.71	67	4.81	81	4.84	86.0	4.16	11.0	4.17	11.4	4.03	3.00
3....	4.71	67	4.83	84	4.82	83.0	4.16	11.0	4.17	11.4	4.03	2.90
4....	4.72	69	4.85	87	4.78	77.0	3.94	3.7	4.17	11.4	4.03	2.70
5....	4.68	63	4.78	77	4.76	74.0	3.92	3.2	4.17	11.4	4.03	2.50
6....	4.68	63	4.80	80	4.72	69.0	3.92	3.2	4.16	11.0	4.01	2.40
7....	4.68	63	4.83	84	4.67	62.0	3.92	3.2	4.15	10.5	4.01	2.30
8....	4.70	66	4.81	81	4.68	63.0	3.96	4.1	4.15	10.5	3.99	2.30
9....	4.72	69	4.77	76	4.66	60.0	3.97	4.3	4.14	10.0	3.99	2.20
10....	4.72	69	4.78	77	4.64	58.0	3.97	4.3	4.14	10.0	3.99	2.20
11....	4.88	91	4.88	91	4.57	48.0	3.99	4.8	4.12 ^b	8.7	3.99	2.10
12....	4.88	91	4.90	94	4.57	48.0	3.99	4.8	4.12	8.0	4.00	2.10
13....	4.88	91	4.93	98	4.54	44.0	4.02	5.6	4.12	7.3	4.01	2.10
14....	4.82	83	4.82	83	4.66	60.0	4.04	6.3	4.12	6.7	4.01	2.00
15....	4.82	83	4.80	80	4.46	35.0	4.06	6.9	4.12	5.7	4.01	2.00
16....	4.88	91	4.76	74	4.46	35.0	4.06	6.9	4.12	5.0	4.01	2.00
17....	4.88	91	4.74	72	4.46	35.0	4.26	16.8	4.12	4.7	4.00	1.90
18....	4.92	97	4.66	60	4.45	34.0	4.30	19.4	4.12	4.6	4.00	1.90
19....	4.80	80	4.60	52	4.46	35.0	4.06	6.9	4.11	4.5	4.00	1.80
20....	4.79	79	4.47	36	4.46	35.0	4.06	6.9	4.11	4.4	4.00	1.70
21....	4.80	80	4.46	35	4.40	28.0	4.18	11.9	4.07	4.3	3.99	1.70
22....	4.69	65	4.51	40	4.43	31.0	4.23	14.8	4.07	4.0	3.99	1.60
23....	4.66	60	4.68	63	4.37	25.0	4.24	15.4	4.07	3.9	3.99	1.50
24....	4.68	63	4.73	70	4.39	27.0	4.23	14.8	4.07	3.9	3.99	1.40
25....	4.68	63	4.76	74	4.39	27.0	4.23	14.8	4.07	3.7	3.99	1.30
26....	4.68	63	4.78	77	4.36	25.0	4.24	15.4	4.07	3.6	3.99	1.20
27....	4.71	67	4.78	77	4.30	19.4	4.24	15.4	4.05	3.3	3.99	1.20
28....	4.71	67	4.78	77	4.26	16.8	4.23	14.8	4.05	3.1	3.99	1.10
29....	4.71	67	4.78	77	4.18	11.9	4.20	12.8	4.05	3.1	3.99	1.04
30....	4.75	73	4.77	76	4.16	11.0	4.20	12.8	4.03	3.0	3.98	1.02
31....	4.79	79	4.86	88	.....	.....	4.18	11.9	.....	.....	3.93 ^b	0.86

^b Ice conditions November 11 to December 31.

MONTHLY DISCHARGE of Louise creek near Lake Louise, for 1916

(Drainage area 10 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	1.40	0.58	0.77	0.077	0.09	47
February.....	0.48	0.30	0.35	0.035	0.04	20
March.....	1.05	0.36	0.48	0.048	0.06	30
April.....	0.61	0.54	0.58	0.058	0.06	35
May.....	8.20	1.26	4.40	0.440	0.50	271
June.....	69.00	7.90	37.00	3.700	4.13	2,202
July.....	91.00	60.00	74.00	7.400	8.53	4,550
August.....	98.00	35.00	74.00	7.400	8.53	4,550
September.....	86.00	11.00	45.00	4.500	5.02	2,678
October.....	19.40	3.20	9.60	0.960	1.11	590
November.....	11.90	3.00	6.80	0.680	0.76	405
December.....	3.00	0.86	1.90	0.190	0.22	117
The year.....	.....	.....	.....	.....	29.05	15,495

SESSIONAL PAPER No. 25B

FORTYMILE CREEK AT BANFF

Location.—On the SW. $\frac{1}{4}$ Sec. 2, Tp. 26, Rge. 12, W. 5th Mer., near the Canadian Pacific railway station at Banff and one mile from the mouth of the stream.

Records available.—August 1, 1912, to December 31, 1916.

Gauge.—Vertical staff; elevation of zero maintained at 91.43 feet since establishment.

Bench-mark.—Permanent iron bench-mark on right bank; assumed elevation 100.00 feet.

Channel.—Clay and gravel.

Discharge measurements.—Made from bridge and by wading.

Observer.—S. Neilson.

DISCHARGE MEASUREMENTS of Fortymile creek near Banff, for 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 13.....	H. C. Ritchie.....	24.0	26.0	0.63	3.43	16.4
Jan. 25.....	J. M. Paul.....	25.0	32.5	0.67	2.61	22.0
Feb. 5.....	H. C. Ritchie.....	23.0	28.5	0.54	2.81	15.4
Feb. 19.....	do.....	26.0	40.0	0.76	2.60	31.0
Mar. 3.....	do.....	25.0	31.0	0.45	2.64	14.0
Mar. 15.....	do.....	25.0	16.7	1.24	2.42	20.8
Mar. 27.....	do.....	26.0	16.2	1.16	2.39	18.7
April 14.....	do.....	28.0	18.6	1.17	2.50	22.0
May 11.....	do.....	30.5	25.6	2.14	2.73	55.0
June 2.....	do.....	40.5	44.3	1.85	3.10	82.0
June 22.....	do.....	32.0	189.0	2.75	7.07	519.0
July 4.....	do.....	32.0	161.0	3.06	6.37	492.0
July 28.....	do.....	32.0	81.4	2.08	4.04	168.0
Aug. 19.....	do.....	32.0	71.4	1.76	3.48	126.0
Sept. 2.....	do.....	30.0	60.7	1.45	3.25	88.0
Oct. 5.....	do.....	29.0	30.8	1.79	2.99	55.0
Oct. 25.....	do.....	28.0	32.7	1.38	2.93	45.0
Nov. 13.....	do.....	23.0	22.2	0.72	2.60	16.0
Dec. 5.....	do.....	25.0	27.0	0.95	2.75	26.0
Dec. 27.....	W. K. Broughton.....	23.0	18.1	0.73	3.32	13.2

DAILY GAUGE HEIGHT AND DISCHARGE of Fortymile creek near Banff, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	2.72 ^b	16.8	2.38	18.3	2.50	14.5	2.46 ^b	27	2.51	32	3.00	74
2	2.87	16.7	2.17	17.3	2.52	14.2	2.47	29	2.57	37	3.15	88
3	2.88	16.4	2.06	16.4	2.64	14.0	2.45	27	2.67	45	3.12	85
4	3.16	16.2	2.63	15.8	2.62	14.8	2.45	27	2.69	47	3.15	88
5	3.17	16.0	2.80	15.4	2.62	16.0	2.44	26	2.85	62	3.22	94
6	3.15	15.8	2.78	15.6	2.50	16.7	2.48	29	2.97	71	3.22	94
7	3.13	15.6	2.57	16.0	2.44	17.0	2.49	30	2.97	71	3.25	96
8	3.11	15.7	2.56	16.7	2.44	17.0	2.50	31	2.95	70	3.20	92
9	3.17	15.9	2.66	17.5	2.44	17.2	2.51	32	2.87	63	3.22	94
10	3.25	16.1	2.71	18.8	2.46	17.7	2.51	32	2.82	59	3.25	96
11	3.28	16.2	2.65	20.0	2.48	19.0	2.50	31	2.80	57	3.32	103
12	3.33	16.3	2.56	22.0	2.50	19.8	2.49	30	2.73	51	3.40	110
13	3.47	16.4	2.55	24.0	2.44	20.0	2.49	30	2.71	49	3.45	114
14	3.51	17.3	2.46	27.0	2.52	21.0	2.50	31	2.68	46	3.62	131
15	3.53	18.6	2.52	29.0	2.49	21.0	2.50	31	2.67	45	4.25	196
16	3.63	19.9	2.55	30.0	2.49	21.0	2.50	31	2.65	44	5.40	335
17	3.83	21.0	2.82	32.0	2.47	20.0	2.49	30	2.65	44	6.60	506
18	3.28	23.0	2.70	32.0	2.53	20.0	2.47	29	2.72	50	7.10	584
19	2.73	24.0	2.54	31.0	2.51	21.0	2.46	28	2.73	51	7.90	712
20	2.51	25.0	2.50	29.0	2.49	21.0	2.45	27	2.74	52	7.50	648
21	2.27	25.0	2.47	26.0	2.49	21.0	2.45	27	2.87	63	7.10	584
22	2.12	25.0	2.43	24.0	2.45	20.0	2.45	27	2.91	66	6.10	431
23	2.04	24.0	2.41	22.0	2.45	20.0	2.45	27	2.93	68	6.00	416
24	2.00	23.0	2.40	20.0	2.45	19.5	2.45	27	2.96	70	5.90	402
25	2.07	22.0	2.38	18.2	2.43	19.0	2.46	28	2.98	72	6.20	446
26	2.04	21.0	2.41	17.0	2.43	19.0	2.51	32	3.00	74	6.70	521
27	2.63	21.0	2.39	16.0	2.43	18.7	2.52	33	2.88	64	6.80	536
28	2.06	20.0	2.41	15.3	2.41	18.9	2.53	33	2.96	70	6.70	521
29	2.64	20.0	2.40	14.7	2.40	20.0	2.52	33	3.00	74	6.60	506
30	2.78	19.7	.....	.....	2.40	23.0	2.51	32	3.00	74	6.40	476
31	2.77	19.2	.....	.....	2.40	25.0	.....	.....	2.99	73	.....	.....

^b Ice conditions, January 1 to April 1.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Fortymile creek near Banff, for 1916—*Concluded*

Day	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	6.00	416	3.77	146	3.26	89	3.09	65	2.89	40	2.79	30.0
2....	6.30	461	3.82	151	3.30	95	3.08	63	2.90	41	2.80	31.0
3....	6.50	491	3.97	166	3.30	95	3.08	63	2.91	42	2.82	33.0
4....	6.31	462	3.72	141	3.30	95	3.07	62	2.90	41	2.75	27.0
5....	6.01	418	3.62	131	3.35	104	3.07	62	2.89	40	2.75	27.0
6....	5.41	336	3.52	121	3.40	112	3.07	62	2.89	40	2.65b	26.0
7....	6.01	418	3.52	121	3.30	95	3.06	61	2.84	35	2.64	25.0
8....	6.11	432	3.62	131	3.25	88	3.06	61	2.82	33	2.55	25.0
9....	6.01	418	3.92	161	3.25	88	3.06	61	2.82	33	2.54	24.0
10....	6.41	478	3.92	161	3.25	88	3.06	61	2.81	32	2.55	23.0
11....	6.11	432	3.67	136	3.25	88	3.05	60	2.81	32	2.52	22.0
12....	6.21	448	3.62	131	3.25	88	3.03	57	2.65	20	2.52	22.0
13....	5.81	389	3.62	131	3.25	88	3.01	54	2.65	20	2.56	22.0
14....	5.51	349	3.52	121	3.25	88	3.01	54	2.62	17	2.57	22.0
15....	5.26	317	3.47	116	3.20	80	2.96	48	2.62	17	2.59	22.0
16....	5.41	336	3.42	112	3.20	80	2.91	42	2.70	23	2.62	21.0
17....	5.51	349	3.42	112	3.20	80	2.91	42	2.75	27	2.66	21.0
18....	5.66	369	3.62	131	3.15	73	3.01	54	2.78	29	2.61	19.6
19....	4.76	254	3.52	121	3.15	73	3.01	54	2.80	31	2.64	18.7
20....	4.11	180	3.50	130	3.15	73	3.01	54	2.80	31	2.65	17.5
21....	4.21	191	3.45	121	3.19	79	3.01	54	2.82	33	3.30	16.0
22....	4.11	180	3.40	112	3.19	79	3.01	54	2.86	37	3.35	14.8
23....	4.11	180	3.35	104	3.15	73	3.01	54	2.85	36	2.79	14.2
24....	4.21	191	3.40	112	3.15	73	2.99	52	2.68	22	2.82	13.8
25....	4.11	180	3.40	112	3.12	69	2.96	48	2.75	27	3.29	13.5
26....	4.11	180	3.40	112	3.10	66	2.95	47	2.78	29	3.31	13.4
27....	4.16	186	3.41	114	3.10	66	2.95	47	2.82	33	3.32	13.2
28....	4.22	192	3.41	114	3.10	66	2.94	46	2.81	32	3.42	13.9
29....	4.12	181	3.31	97	3.10	66	2.92	43	2.80	31	3.47	15.7
30....	3.97	166	3.31	97	3.18	77	2.91	42	2.82	33	3.47	17.4
31....	3.72	141	3.31	97	.....	.....	2.91	42	.....	.....	3.47b	18.3

b Ice conditions, December 6 to December 31.

MONTHLY DISCHARGE of Fortymile creek near Banff, for 1916

(Drainage area 62 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	25	15.6	19.3	0.311	0.36	1,187
February.....	32	14.7	21.0	0.339	0.37	1,208
March.....	25	14.0	18.9	0.305	0.35	1,162
April.....	33	26.0	30.0	0.484	0.54	1,785
May.....	74	32.0	59.0	0.952	1.10	3,628
June.....	712	74.0	306.0	4.935	5.51	18,208
July.....	491	141.0	314.0	5.065	5.84	19,307
August.....	166	97.0	125.0	2.016	2.32	7,686
September.....	112	66.0	82.0	1.323	1.48	4,879
October.....	65	42.0	54.0	0.871	1.00	3,320
November.....	42	17.0	31.0	0.500	0.56	1,845
December.....	33	13.2	21.0	0.339	0.39	1,291
The year.....					19.82	65,506

MEAN MONTHLY DISCHARGE in Second-feet of Fortymile creek near Banff

MONTH	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		69	65	64.0	61.0	54.0	63	3,850
November.....		45	44	43.0	45.0	31.0	42	2,477
December.....		26	33	24.0	18.6	21.0	25	1,504
January.....		29	23	27.0	19.3		25	1,508
February.....		25	22	20.0	21.0		22	1,239
March.....		21	28	15.5	18.9		21	1,276
April.....		37	29	33.0	30.0		32	1,921
May.....		94	122	77.0	59.0		88	5,418
June.....		366	306	184.0	306.0		290	17,286
July.....		165	201	227.0	314.0		227	13,942
August.....	145	120	78	115.0	125.0		117	7,172
September.....	108	98	53	72.0	82.0		83	4,910
Total in acre-feet...	15,342	66,075	60,767	54,665	66,623			62,503

BOW RIVER AT BANFF

Location.—On the SE. $\frac{1}{4}$ Sec. 35, Tp. 25, Rge. 12, W. 5th Mer., at the highway bridge at Banff.

Records available.—May 25, 1909, to November 11, 1909; April 26, 1910, to December 31, 1915.

Gauge.—Chain gauge on bridge; elevation of zero maintained at 92.04 feet during 1909-12; elevation of zero maintained at 93.21 feet during 1913; elevation of zero maintained at 93.06 feet during 1914; elevation of zero maintained at 87.23 feet during 1915-16.

Bench-mark.—Permanent iron bench-mark on the right bank; assumed elevation 100.00 feet. This bench-mark is at datum 99.68 feet referred to the old bench-mark now destroyed.

Channel.—Permanent; gravel and boulders.

Discharge measurements.—Made from bridge.

Observer.—N. B. Sanson.

Accuracy.—The gauge at this station was read once daily, at the same hour, to one-hundredth of a foot and the records are fairly accurate.

The daily discharges are computed from an open water curve, which runs through eight out of eleven discharge measurement points, the remaining three plotting very close to the curve. The discharges are well within the limit of error.

During the winter the daily discharge is determined from a study of daily gauge heights, temperatures and discharge measurements and is a reasonably close estimate.

DISCHARGE MEASUREMENTS of Bow river at Banff, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 17.....	J. M. Paul.....	59.0	155	2.32	6.59	359
Feb. 17.....	H. C. Ritchie.....	50.0	157	2.32	6.76	365
Mar. 2.....	do.....	52.5	124	1.99	6.01	246
Mar. 17.....	do.....	55.0	97	2.68	6.10	261
Mar. 31.....	do.....	58.0	131	2.28	6.04	299
April 17.....	do.....	98.0	161	2.15	6.15	347
May 12.....	do.....	195.0	326	2.49	7.07	812
June 10.....	do.....	338.0	691	2.73	8.06	1,882
June 19.....	do.....	372.0	1,763	5.68	10.90	10,021
June 20.....	do.....	380.0	1,940	5.56	11.45	10,786 _x
June 21.....	do.....	378.0	1,903	5.59	11.32	10,640
June 24.....	do.....	362.0	1,396	4.37	9.90	6,100 _x
July 29.....	do.....	340.0	1,007	4.10	8.63	4,129
Aug. 14.....	do.....	340.0	965	2.83	8.44	2,728
Sept. 7.....	do.....	339.5	901	2.68	8.32	2,417
Oct. 9.....	do.....	314.0	487	1.58	7.08	772
Oct. 24.....	do.....	324.0	528	1.64	7.18	864
Nov. 16.....	do.....	128.0	257	1.70	6.53	438
Dec. 9.....	do.....	117.0	205	1.78	6.39	365
Dec. 26.....	W. K. Broughton.....	108.0	113	1.79	6.51	345

_x Slope measurement.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Bow river at Banff, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	6.23 ^b	357	7.27	358	6.02	252	6.09	317	6.51	474	7.62	1,294
2....	6.24 ^a	354	7.28	359	6.03	246	6.08 ^a	314	6.70	565	7.62	1,294
3....	6.26	353	7.28	360	6.10	246	6.08	314	6.94	701	7.59	1,259
4....	6.30	352	7.33	360	6.10	249	6.06	308	7.12	830	7.71 ^a	1,402
5....	6.33	350	7.32	363	6.10 ^a	252	6.06	308	7.44	1,100	7.83	1,552
6....	6.41	348	7.38 ^a	365	6.10	252	6.06	308	7.58	1,248	7.82	1,538
7....	6.46	348	7.44	368	6.09	251	6.10	320	7.50 ^a	1,160	7.80	1,510
8....	6.49	347	7.38	370	6.07	250	6.14	334	7.43	1,090	7.84	1,566
9....	6.48 ^a	347	7.40	373	6.10	253	6.16 ^a	341	7.30	970	8.02	1,846
10....	6.46	348	7.37	374	6.11	258	6.19	352	7.24	922	8.05	1,900
11....	6.51	348	7.36	375	6.17	262	6.17	344	7.12	830	8.01	1,828
12....	6.54	349	7.37	375	6.14 ^a	262	6.12	327	7.07	792	8.02	1,846
13....	6.55	351	7.35 ^a	375	6.12	259	6.13	330	6.73	580	8.07	1,936
14....	6.54	353	7.33	375	6.05	255	6.18	348	6.88 ^a	663	8.33	2,433
15....	6.56	356	7.16 ^a	372	6.10	258	6.21	358	7.04	770	8.76	3,436
16....	6.58 ^a	358	6.99 ^a	369	6.10	259	6.18 ^a	348	7.07	792	9.44	5,323
17....	6.59	359	6.81	365	6.10	261	6.16	341	7.15	852	10.09	7,270
18....	6.62	359	6.43	332	6.15	266	6.13 ^a	330	7.27	946	10.48	8,440
19....	6.63	358	6.33	319	6.13 ^a	267	6.10	320	7.41	1,070	10.84	9,520
20....	6.70	357	6.26 ^a	312	6.11	270	6.12	327	7.49	1,150	11.31	10,930
21....	6.75	357	6.18	307	6.12	274	6.14	334	7.46 ^a	1,120	11.20	10,600
22....	6.76	355	6.16	303	6.12	280	6.12	327	7.44	1,100	10.68	9,040
23....	6.78 ^a	354	6.16	300	6.07 ^b	290	6.12 ^a	327	7.41	1,070	10.14	7,420
24....	6.80	353	6.13	297	6.05	305	6.11	324	7.39	1,051	9.93	6,790
25....	6.96	352	6.12	293	6.07	311	6.14	334	7.35	1,015	10.00	7,000
26....	7.04	352	6.12	290	6.06 ^a	308	6.23	366	7.33	997	10.09	7,270
27....	7.07	352	6.10 ^a	284	6.06	308	6.47	457	7.42	1,080	10.12	7,360
28....	7.09	353	6.09	277	6.03	299	6.56	497	7.62	1,294	10.55	8,650
29....	7.17	353	6.12	262	6.02	296	6.56	497	7.64	1,318	10.50	8,500
30....	7.21 ^a	355	.....	.....	6.00	290	6.54 ^a	488	7.62	1,294	9.85	8,550
31....	7.25	357	.....	.....	6.05	305	.....	.....	7.60	1,270	.....	.....

^a Gauge height interpolated.^b Ice conditions from January 1 to March 23.

DAILY GAUGE HEIGHT AND DISCHARGE of Bow river at Banff, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	9.70	6,100	8.70	3,280	8.51	2,823	7.38	1,042	7.01	748	6.60	460
2....	9.78	6,340	8.71	3,306	8.50	2,800	7.32	988	6.99	734	6.60	460
3....	9.90	6,700	8.79	3,514	8.59	3,007	7.28	954	6.94	701	6.64a	480
4....	9.92	6,760	8.67	3,205	8.63	3,105	7.23	914	7.05	778	6.69	500
5....	9.62	5,860	8.55	2,915	8.61	3,055	7.20	890	6.96a	714	6.56	450
6....	9.38	5,147	8.52a	2,846	8.48	2,756	7.16	860	6.87	657	6.40	380
7....	9.40	5,205	8.49	2,778	8.27	2,310	7.14	845	6.90	675	6.32	340
8....	9.92	6,760	8.56	2,938	8.20	2,170	7.10a	815	6.92	688	6.42	380
9....	10.32	7,960	8.76	3,436	8.23	2,230	7.05	778	6.92	688	6.40	365
10....	10.45	8,350	8.74	3,384	8.06	1,918	7.08	800	6.79	610	6.42a	380
11....	10.28	7,840	8.54	2,892	7.97	1,762	7.05	778	6.61	520	6.45	387
12....	10.05	7,150	8.44	2,668	8.03	1,864	7.03	762	6.23	366	6.50	390
13....	10.25	7,750	8.44a	2,668	7.94	1,714	7.02	755	6.12	327	6.42	390
14....	10.03	7,090	8.43	2,646	7.90	1,650	7.02	755	6.32	397	6.43	385
15....	9.55	5,650	8.51	2,823	7.81	1,524	7.02a	755	6.49b	420	6.46	385
16....	9.45	5,352	8.46	2,712	7.77	1,474	7.03	762	6.53	438	6.47	385
17....	9.80	6,400	8.35	2,475	7.74a	1,438	7.42	1,080	6.60	460	6.46a	385
18....	9.92	6,760	8.46	2,712	7.72	1,414	7.53	1,193	6.58	450	6.45	283
19....	9.56	5,680	8.29	2,350	7.69	1,378	7.42	1,080	6.61a	465	6.55	380
20....	9.32	4,973	8.18a	2,134	7.64	1,318	7.36	1,024	6.64	480	6.53	377
21....	9.07	4,278	8.06	1,918	7.60	1,270	7.30	970	6.64	480	6.53	378
22....	8.90	3,810	8.04	1,882	7.59	1,259	7.24a	922	6.72	520	6.71	380
23....	8.77a	3,462	8.30	2,370	7.57	1,237	7.17	868	6.63	475	6.76	380
24....	8.64	3,130	8.33	2,433	7.58a	1,248	7.17	868	6.47	410	6.69a	375
25....	8.65	3,155	8.34	2,454	7.59	1,259	7.13	838	6.61	470	6.62	359
26....	8.76	3,436	8.34	2,454	7.54	1,204	7.14	845	6.64a	480	6.54	345
27....	8.75	3,410	8.34a	2,454	7.49	1,150	7.13	838	6.67	500	6.46	336
28....	8.76	3,436	8.33	2,433	7.43	1,090	7.01	748	6.67	500	6.44	330
29....	8.71a	3,306	8.33	2,433	7.36	1,024	7.00a	740	6.63	480	6.37	329
30....	8.65a	3,155	8.32	2,412	7.42	1,080	7.00	740	6.64	480	6.42	329
31....	8.60	3,030	8.37	2,517	.....	.....	7.03	762	.....	.....	6.44ab	330

a Gauge height interpolated.

b Ice conditions November 15 to December 31.

MONTHLY DISCHARGE of Bow river at Banff, for 1916

(Drainage area 884 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	359	347	353	0.399	0.46	21,705
February.....	375	262	339	0.383	0.41	19,500
March.....	311	246	271	0.307	0.35	16,663
April.....	497	308	351	0.397	0.44	20,886
May.....	1,318	474	971	1.100	1.27	59,704
June.....	10,930	1,259	4,910	5.550	6.19	292,165
July.....	8,350	3,030	5,401	6.110	7.04	332,094
August.....	3,514	1,882	2,692	3.050	3.52	165,525
September.....	3,105	1,080	1,784	2.020	2.25	106,155
October.....	1,193	740	870	0.984	1.13	53,494
November.....	778	327	537	0.607	0.68	31,954
December.....	500	329	384	0.434	0.50	23,611
The year.....					24.24	1,143,456

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of Bow river at Banff

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		834	1,204	680	1,017	1,013	1,219	870	870	963	59,236
Nov.		<i>b</i> 466	819	415	584	603	581	548	537	545	32,410
Dec.			<i>e</i> 451	380	429	399	359	445	384	399	24,554
January			347	291	321	350	287	353		325	19,969
February			327	266	280	315	277	339		301	16,900
March			302	224	256	285	266	271		267	16,437
April		<i>c</i>	367	295	412	399	553	351		396	23,570
May	<i>a</i>	2,596	3,090	1,240	1,485	1,395	1,846	1,589	971	1,659	102,033
June		6,204	5,346	6,251	3,430	5,624	4,922	3,234	4,910	4,990	296,935
July		5,787	4,723	4,438	3,566	3,552	4,861	4,394	5,401	4,590	282,241
August		2,473	2,778	2,565	3,530	3,025	2,602	3,557	2,692	2,903	178,483
Sept.		1,578	1,257	1,504	1,847	2,028	1,484	1,570	1,784	1,631	97,085
Total in Acre-ft.	1,007,051	1,128,047	1,173,262	995,952	1,144,703	1,156,549	1,086,325	1,147,861			1,149,853

a 25-31.*b* 1-11.*c* 26-30.*d* 1-16.*e* 28 days.

SPRAY RIVER NEAR SPRAY LAKES

Location.—On the SE. $\frac{1}{2}$ Sec. 31, Tp. 22, Rge. 10, W. 5th Mer., one-half mile above Spray creek.

Records available.—July 23 to October 27, 1914 (discharge measurements only). June 9 to October 17, 1915, and July 17 to October 31, 1916.

Gauge.—Chain gauge on right bank; elevation of zero 88.52 feet maintained since establishment.

Bench-mark.—On tree; assumed elevation 100.00 feet.

Channel.—Permanent.

Discharge measurements.—Made by wading. Cable station installed above gauge September 15, 1915.

Observer.—Geo. Pickering.

Remarks.—Insufficient discharge measurements were made in 1914 and 1915 to accurately determine the daily discharge.

DISCHARGE MEASUREMENTS of Spray river near Spray lakes, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
July 17	H. C. Ritchie	83	318	5.85	7.60	1,858
Sept. 28	do	80	160	2.02	5.93	323

DAILY GAUGE HEIGHT AND DISCHARGE of Spray river near Spray lakes, for 1916

Day	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			6.66a	753	6.48a	621	5.84a	290
2.....			6.68	768	6.49	627	5.80	275
3.....			6.64a	737	6.58a	692	5.82a	282
4.....			6.61	714	6.67	761	5.84	290
5.....			6.54a	663	6.64a	737	5.81a	279
6.....			6.47	614	6.62	722	5.78	268
7.....			6.52a	648	6.57a	684	5.76a	261
8.....			6.57	684	6.52	648	5.75	258
9.....			6.55a	670	6.49a	627	5.76a	261
10.....			6.53	656	6.46	608	5.78	268
11.....			6.50a	634	6.38a	556	5.76a	261
12.....			6.46	608	6.31	514	5.75	258
13.....			6.44a	594	6.30a	508	5.74a	254
14.....			6.41	575	6.29	502	5.72	247
15.....			6.40a	568	6.30a	508	5.71a	244
16.....			6.40	568	6.31	514	5.70	240
17.....	7.60	1,861	6.42a	581	6.22a	464	5.70a	240
18.....	7.55a	1,793	6.45	601	6.14	422	5.70	240
19.....	7.50	1,725	6.46a	608	6.16a	433	5.69a	236
20.....	7.52a	1,752	6.47	614	6.18	443	5.68	233
21.....	7.55	1,793	6.51a	641	6.10a	402	5.68a	233
22.....	7.47a	1,684	6.55	670	6.03	369	5.67	230
23.....	7.39	1,575	6.60a	706	6.02a	364	5.65a	223
24.....	7.34a	1,507	6.64	737	6.01	360	5.63	215
25.....	7.29	1,440	6.62a	722	5.99a	351	5.62a	212
26.....	7.26a	1,399	6.59	699	5.97	342	5.60	205
27.....	7.24	1,373	6.56a	677	5.94a	329	5.60a	205
28.....	7.01a	1,089	6.54	663	5.90	312	5.60	205
29.....	6.78	854	6.49	627	5.88a	305	5.60	205
30.....	6.70a	784	6.48a	621	5.87	301	5.60	205
31.....	6.63	729	6.48	621			5.58	199

a Gauge height interpolated.

MONTHLY DISCHARGE of Spray river near Spray lakes, for 1916

(Drainage area 193 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
July (17-31).....	1,861	729	1,424	7.38	4.12	42,357
August.....	768	568	653	3.38	3.90	40,151
September.....	761	301	501	2.60	2.90	29,812
October.....	290	199	243	1.26	1.45	14,941
The period.....					12.37	127,261

SESSIONAL PAPER No. 25b

SPRAY CREEK AT SPRAY LAKES

Location.—On the SW. $\frac{1}{4}$ Sec. 32, Tp. 22, Rge. 10, W. 5th Mer.

Records available.—July 23 to October 27, 1914 (discharge measurements only), June 9 to October 17, 1915, and July 16 to October 31, 1916.

Gauge.—Vertical staff at right bank; assumed elevation 95.02 feet, maintained since establishment.

Bench-mark.—Three spikes together on tree; assumed elevation 100.00 feet.

Channel.—Permanent.

Discharge measurements.—Made by wading.

Observer.—Geo. Pickering.

DISCHARGE MEASUREMENTS of Spray creek at Spray lakes, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec</i>	<i>Feet</i>	<i>Sec.-ft.</i>
July 17	H. C. Ritchie.....	39	62.2	4.77	1.94	311
Sept. 27	do	35	33.0	2.95	0.71	97
Sept 28	do	35	33.3	2.85	0.70	95

DAILY GAUGE HEIGHT AND DISCHARGE of Spray creek at Spray lakes, for 1916

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1			1.22a	168	1.16a	159	0.64a	89
2			1.15	157	1.09	148	0.62	87
3			1.14a	155	1.34a	190	0.64a	89
4			1.14	155	1.59	239	0.65	90
5			1.13a	154	1.54a	229	0.63a	88
6			1.12	152	1.49	219	0.61	86
7			1.25a	174	1.48a	217	0.59a	84
8			1.38	197	1.46	213	0.57	82
9			1.36a	193	1.32a	186	0.58a	83
10			1.35	192	1.19	163	0.58	83
11			1.32a	186	1.12a	152	0.56a	81
12			1.30	182	1.04	140	0.55	80
13			1.28a	179	1.03a	138	0.55a	80
14			1.26	175	1.02	137	0.55	80
15			1.26a	175	1.00a	134	0.54a	79
16	1.85	294	1.25	174	0.99	133	0.53	78
17	1.94	312	1.22a	168	0.94a	126	0.54a	79
18	1.97a	319	1.18	162	0.89	119	0.54	79
19	2.00	325	1.22a	168	0.87a	116	0.54a	79
20	1.95a	314	1.25	174	0.85	114	0.53	78
21	1.90	304	1.22a	168	0.83a	111	0.52a	77
22	1.88a	300	1.19	163	0.81	108	0.52	77
23	1.85	294	1.26a	175	0.80a	107	0.50a	75
24	1.84a	291	1.34	190	0.79	106	0.48	73
25	1.83	289	1.36a	193	0.76a	102	0.50a	75
26	1.72a	266	1.39	199	0.74	100	0.51	76
27	1.60	241	1.38a	197	0.71a	96	0.52a	77
28	1.45a	211	1.36	193	0.68	93	0.53	78
29	1.30	182	1.27	177	0.66a	91	0.53	78
30	1.29a	180	1.26a	175	0.65	90	0.48	73
31	1.28	179	1.24	172			0.48	73

a Gauge height interpolated.

MONTHLY DISCHARGE of Spray creek at Spray lakes, for 1916

(Drainage area 35 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
July 16-31.....	325	179	269	7.69	4.57	8,535
August.....	199	152	176	5.03	5.80	10,822
September.....	239	90	143	4.09	4.56	8,509
October.....	90	73	80	2.29	2.64	4,919
The period.....					17.57	32,785

SPRAY RIVER NEAR BANFF

Location.—On the SW. $\frac{1}{4}$ Sec. 25, Tp. 25, Rge. 12, W. 5th Mer., at the highway bridge near the Canadian Pacific Railway Banff Springs Hotel, near the confluence of the stream with the Bow river.

Records available.—July 15, 1910, to December 31, 1916.

Gauge.—Chain on left bank; elevation of zero maintained at 93.29 feet during 1910-11. Elevation of zero maintained at 88.71 feet during 1912-16.

Bench-mark.—Permanent iron bench-mark on the left bank; assumed elevation 100.00 feet.

Channel.—Permanent; gravel; large boulders at left bank near pier.

Discharge measurements.—Made from a bridge.

Observer.—N. B. Sanson.

DISCHARGE MEASUREMENTS of Spray river near Banff, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		Feet	Sq. ft.	Ft. per sec.	Feet	Sec.-ft.
Jan. 4.....	H. C. Ritchie.....	32.5	69	2.56	5.35	176
Jan. 22.....	J. M. Paul.....	26.5	86	2.26	5.31	194
Feb. 18.....	H. C. Ritchie.....	24.5	63	2.34	5.02	158
Mar. 4.....	do.....	24.5	62	2.24	5.02	138
Mar. 16.....	do.....	24.5	62	2.63	5.02	164
Mar. 27.....	do.....	32.5	61	2.76	4.66	168
April 15.....	do.....	37.5	63	2.86	4.72	180
May 11.....	do.....	87.5	94	3.75	5.38	352
June 2.....	do.....	114.0	130	4.01	5.59	520
June 20.....	do.....	121.5	510	9.09	9.32	4,644
July 5.....	do.....	102.5	345	8.62	8.15	2,971
July 26.....	do.....	75.0	220	6.87	6.69	1,514
Aug. 12.....	do.....	70.5	174	6.25	6.25	1,084
Sep. 1.....	do.....	67.5	171	6.06	6.02	1,035
Oct. 5.....	do.....	58.5	121	4.28	5.13	516
Oct. 23.....	do.....	58.0	106	3.55	4.94	375
Nov. 14.....	do.....	45.5	83	2.92	4.55	243
Dec. 7.....	do.....	47.5	69	2.56	4.30	177
Dec. 27.....	W. K. Broughton.....	32.5	57	3.03	4.28	170

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Spray river near Banff, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	4.85 ^b	178	5.25	175	4.91	138	4.62	160	4.97	257	5.63	555
2....	5.10 ^a	181	5.31	175	4.90	137	4.62 ^a	160	4.99	264	5.61	541
3....	5.30	181	5.39	177	4.90	137	4.61	157	5.14	317	5.62	548
4....	5.11	180	5.48	179	5.09	138	4.61	157	5.24	356	5.74 ^a	628
5....	5.37	181	5.19	172	5.11 ^a	144	4.60	155	5.41	429	5.87	726
6....	5.54	187	5.18 ^a	169	5.13	146	4.61	157	5.51	486	5.87 ^a	726
7....	5.48	188	5.16	170	5.09	146	4.63	163	5.53 ^a	496	5.88	734
8....	5.44	187	5.39	174	5.15	149	4.63	163	5.55	508	5.94	784
9....	5.37 ^a	185	5.29	172	5.15	153	4.65 ^a	167	5.49	475	6.03	862
10....	5.30	180	5.27	169	5.16	155	4.67	173	5.46	452	6.14	963
11....	5.29	177	5.22	167	5.14	158	4.67	173	5.38	415	6.13 ^a	953
12....	5.35	175	5.25	167	5.15 ^a	160	4.65	167	5.32	389	6.12	944
13....	5.32	175	5.22 ^a	166	5.15	162	4.66	170	5.30	380	6.16	982
14....	5.53	176	5.20	165	5.20	163	4.77	199	5.28 ^a	372	6.35	1,165
15....	5.64	177	5.15 ^a	163	5.16	164	4.70	180	5.26	364	6.92	1,782
16....	5.70 ^a	179	5.10 ^a	161	5.05	164	4.70 ^a	180	5.24	356	7.34	2,244
17....	5.74	184	5.06	158	5.01	163	4.69	178	5.33	343	7.93	2,893
18....	5.65	190	5.02	158	5.21	167	4.69 ^a	178	5.40	424	8.53	3,553
19....	5.56	196	5.00	156	5.09 ^a	167	4.69	178	5.52	491	9.20	4,290
20....	5.56	198	5.00 ^a	155	4.97	164	4.69	178	5.56	513	9.37	4,474
21....	5.50	198	5.01	155	4.96	164	4.69	178	5.58 ^a	524	9.20	4,290
22....	5.31	194	5.00	154	4.94	164	4.59	153	5.61	541	8.73	3,773
23....	5.28 ^a	192	5.03	153	5.04	164	4.62 ^a	160	5.58	524	8.33	3,333
24....	5.24	188	4.97	151	4.73	165	4.66	170	5.54	502	8.24	3,234
25....	5.30	182	4.99	148	4.69	166	4.70	180	5.49	475	8.32 ^a	3,322
26....	5.42	180	5.00	146	4.67 ^a	167	4.76	196	5.46	452	8.40	3,410
27....	5.27	182	5.02 ^a	145	4.65	168	4.98	201	5.49	475	8.38	3,388
28....	5.32	183	5.03	145	4.71 ^b	169	4.96	254	5.54 ^a	502	8.38	3,388
29....	5.27	180	4.95	142	4.64	165	4.93	245	5.59	529	8.42	3,432
30....	5.28 ^a	178	.....	.....	4.62	160	4.95 ^a	251	5.63	555	7.92	2,882
31....	5.30	177	.....	.....	4.61	158	.....	.....	5.62	548	.....	.....

^a Gauge height interpolated.^b Ice conditions, January 1 to March 28.

DAILY GAUGE HEIGHT AND DISCHARGE of Spray river near Banff, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	7.50	2,420	6.47	1,289	6.02	1,035 ^s	5.28 ^a	530	4.81	326	4.50	228
2....	8.00	2,970	6.40	1,215	5.95	973	5.23	505	4.83	333	4.58	251
3....	8.30	3,300	6.46	1,278	6.28 ^a	1,256	5.23	505	4.76	308	4.56 ^a	245
4....	8.18	3,168	6.25	1,068	6.60	1,565	5.19	486	4.83	333	4.55 ^b	240
5....	7.82	2,772	6.35	1,165	6.57	1,535	5.13	459	4.80 ^a	322	4.53	220
6....	7.62	2,552	6.22 ^a	1,039	6.44	1,408	5.14	463	4.76	308	4.43	190
7....	7.58	2,508	6.10	925	6.25	1,228	5.13 ^a	459	4.70	288	4.30	177
8....	8.05	3,025	6.19	1,010	6.13	1,121	5.12 ^a	454	4.73	298	4.40	175
9....	8.35	3,355	6.47	1,289	6.14	1,129	5.10	445	4.74	302	4.40	175
10....	8.40	3,410	6.45	1,267	6.05 ^a	1,052	5.06	427	4.65	273	4.45 ^a	170
11....	8.22	3,212	6.30	1,115	5.96	980	5.04	418	4.62	263	4.50	180
12....	7.92	2,882	6.25	1,068 ^s	5.91	943	5.01	404	4.51 ^a	231	4.29	160
13....	7.81 ^a	2,761	6.20 ^a	1,040	5.84	890	5.02	409	4.40	200	4.43	175
14....	7.70	2,640	6.14	990	5.81	868	4.99	396	4.53	237	4.32	160
15....	7.38	2,288	6.14	1,005	5.74	818	4.98 ^a	392	4.71	291	4.61	180
16....	7.25	2,145	6.11	980	5.68	776	4.97	388	4.74	302	4.49	165
17....	7.70	2,640	6.08	963	5.64 ^a	748	5.07	432	4.76	308	4.50 ^a	165
18....	7.73 ^a	2,673	6.22	1,110	5.61	727	5.04	418	4.76	308	4.52	165
19....	7.76	2,706	6.11	1,005	5.55	687	5.01	404	4.63 ^a	266	4.45	160
20....	7.38	2,288	6.06 ^a	970	5.48	643	4.98	392	4.50	228	4.21	150
21....	7.23	2,123	6.02	945	5.48	643	4.97	388	4.62	263	4.25	155
22....	7.10	1,980	6.20	1,120	5.47	637	4.96 ^a	384	4.61	260	4.36	160
23....	6.96 ^a	1,826	6.45	1,385	5.43	613	4.94	376	4.46	217	4.40	165
24....	6.82	1,672	6.50	1,450	5.40 ^a	595	4.90	350	4.44	211	4.40 ^a	165
25....	6.65	1,455	6.42	1,380	5.38	584	4.88	352	4.61	260	4.41	165
26....	6.60	1,430	6.35	1,320	5.37	578	4.92	368	4.61 ^a	260	4.26	165
27....	6.50	1,320	6.30 ^a	1,275	5.36	573	4.91	364	4.62	263	4.30	170
28....	6.50	1,320	6.24	1,220	5.33	556	4.85	341	4.56	245	4.33	175
29....	6.50 ^a	1,320	6.18	1,160	5.32	551	4.85 ^a	341	4.54	240	4.35	175
30....	6.45 ^a	1,267	6.10	1,100	5.32	551	4.85	341	4.54	240	4.52	165
31....	6.40	1,215	6.06	1,070	.....	.....	4.84	337	.....	.....	4.56 ^{a,b}	165

^a Gauge height interpolated.^b Ice conditions, December 4-31.^s Shifting conditions, August 12 to September 1.

MONTHLY DISCHARGE of Spray river near Banff, for 1916

(Drainage area 299 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	198	175	184	0.616	0.71	11,314
February.....	179	142	162	0.542	0.58	9,318
March.....	169	137	157	0.525	0.61	9,654
April.....	261	153	181	0.605	0.68	10,770
May.....	555	257	444	1.490	1.72	27,300
June.....	4,477	541	2,160	7.220	8.06	128,530
July.....	3,410	1,215	2,344	7.840	9.04	144,126
August.....	1,450	925	1,136	3.800	4.38	69,850
September.....	1,565	551	875	2.920	3.26	52,066
October.....	530	337	411	1.370	1.58	25,271
November.....	333	200	272	0.910	1.02	16,185
December.....	251	150	179	0.599	0.69	11,006
The year.....	.....	.....	.....	.....	32.33	515,390

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of Spray river near Banff

MONTH	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		443	315	428	447	533	364	411	420	25,834
November		^b 226	272	298	333	257	272	276	276	16,439
December		237 ^c	209	237	225	183	193	179	204	12,561
January		199	150	202	196	182	184		186	11,405
February		146	141	151	167	179	162		158	8,855
March		143	108	146	167	172	157		149	9,152
April		156	134	191	180	276	181		186	11,084
May		389	517	535	755	675	444		552	33,972
June		2,011	1,405	2,144	1,942	1,196	2,160		1,810	107,679
July		1,153 ^a	1,523	1,041	1,736	1,477	2,344		1,586	97,550
August		784	829	907	908	772	929	1,136	895	55,032
September		490	544	664	703	491	507	875	611	36,334
Total in acre-feet	116,231	398,687	374,229	420,353	446,766	402,746	512,471			425,897

^a 15-31^b No observations.^c 4-31.

CASCADE RIVER AT BANKHEAD

Location.—On the SE. $\frac{1}{4}$ Sec. 19, Tp. 26, Rge. 11, W. 5th Mer., at the Bankhead Mines.*Records available.*—August 16, 1911, to December 31, 1916.*Gauge.*—Vertical staff; elevation of zero maintained at 93.49 feet since establishment.*Bench-mark.*—Permanent iron bench-mark on right bank; assumed elevation 100.00 feet.*Channel.*—Is being encroached upon by the waste from the mine.*Discharge measurements.*—Made from traffic bridge, three miles below gauge.*Artificial control.*—This station is two and one-half miles below the reservoir of the Calgary Power Company at Lake Minnewanka, near Bankhead Mines water supply, and the flow of the stream is controlled by the gates.*Observer.*—W. E. Cowan.

DISCHARGE MEASUREMENTS of Cascade river at Bankhead, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 15	H. C. Ritchie				3.67	370 ^e
Feb. 18	do	85.0	91.0	3.83	1.92	348
Mar. 4	do	84.0	116.0	4.03	2.14	466
Mar. 16	do	87.0	111.6	3.81	2.30	425
Mar. 30	do	79.0	82.0	2.94	1.88	241
April 20	do	79.0	75.0	2.77	1.71	208
May 10	do	26.0	26.5	1.76	0.86	47
May 29	do	56.0	56.9	0.96	0.92	54
July 31	do	81.0	210.0	2.23	3.91	467
Aug. 17	do	81.0	232.0	2.82	4.15	654
Sept. 8	do	82.0	238.0	2.08	3.56	704
Oct. 7	do	79.0	158.0	1.09	3.06	172
Oct. 28	do	83.0	103.0	3.18	3.63	327
Nov. 20	do	83.5	139.0	4.02	4.18	558
Dec. 8	do				4.17	550 ^e
Dec. 28	W. K. Broughton	91.0	143.8	4.17	7.83	600

^e Estimated discharge: calculated from area and velocity.

DAILY GAUGE HEIGHT AND DISCHARGE of Cascade river at Bankhead, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	2.50 ^b	168	2.44	310	1.90	425	1.77	216	1.16	83	0.94	56
2	2.35	167	2.79	310	2.20	470	1.78	219	1.16	83	0.95	58
3	2.05	165	2.69	320	2.22	473	1.76	213	1.11	76	0.95	58
4	2.06	160	2.96	340	2.16	466	1.73	205	1.06	70	0.95	58
5	2.01	152	2.81	343	2.14	460	2.50	526	1.03	67	0.97	60
6	1.99	145	2.40	335	2.18	456	2.39	470	1.03	67	0.97	60
7	1.98	150	2.06	313	2.16	460	2.31	430	1.04	68	1.02	65
8	1.97	164	2.19	320	2.06	461	2.28	416	1.04	68	1.02	65
9	2.12	210	2.15	325	2.04	455	2.17	365	1.04	68	1.02	65
10	2.74	256	2.10	325	2.01	438	2.09	331	0.86	48	1.01	64
11	2.80	295	2.05	320	1.96	426	2.04	311	0.86	48	1.01	64
12	3.18	330	1.95	320	1.91	417	2.01	299	0.86	48	1.01	64
13	3.33	351	1.89	340	2.06	409	1.95	276	0.86	48	1.02	65
14	3.63	369	1.82	362	2.01	410	1.92	265	0.86	48	1.08	73
15	3.67	370	1.82	365	2.16 ^b	418	1.87	248	0.88	50	1.09	74
16	3.65	370	2.03	360	2.29	425	1.86	245	0.89	51	2.46	108
17	3.07	336	1.99	353	2.26	406	1.78	219	0.89	51	3.62	326
18	2.87	312	1.92	348	2.36	455	1.75	210	0.86	48	3.97	501
19	2.27	295	1.88	343	2.32	435	1.71	199	0.86	48	4.59	878
20	2.21	283	1.84	339	2.27	411	1.72	202	0.86	48	4.67	927
21	2.14	280	2.06	365	2.22	387	1.71	199	0.86	48	4.69	939
22	2.51	281	1.99	376	2.17	365	1.65	182	0.86	48	4.66	921
23	2.69	285	2.01	376	2.12	344	1.56	159	0.86	48	4.66	921
24	2.72	291	1.98	371	2.08	327	1.64	180	0.88	50	4.60	884
25	2.87	300	1.86	364	2.03	307	1.41	125	0.87	49	4.60	884
26	3.10	310	1.92	362	1.97	284	1.56	159	0.91	53	4.59	878
27	3.14	324	1.79	365	1.94	273	1.58	164	0.91	53	4.62	896
28	3.28	336	1.99	360	1.92	265	1.21	91	0.93	55	4.62	896
29	3.28	341	1.95	385	1.87	248	1.21	91	0.94	56	4.62	896
30	3.21	338	.....	.....	1.85	242	1.21	91	0.94	56	4.62	896
31	2.90	320	.....	.....	1.80	225	.....	.....	0.94	56	.....	.....

^b Ice conditions from January 1 to March 15.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Cascade river at Bankhead, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	4.60	884	3.95	488	3.53	551	2.70	170	3.46	269	4.07	531
2....	4.60	884	3.96	500	3.53	570	2.73	168	3.46	269	4.02	530
3....	4.64	908	3.97	508	3.46	543	2.73	162	3.46	269	3.97	501
4....	4.62	896	4.00	528	3.47	570	2.80	164	3.56	303	4.39	756
5....	4.60	884	4.02	544	3.47	589	2.92	175	3.67	347	4.33	719
6....	4.58	872	4.11	604	3.44	588	2.97	170	3.67	347	4.31	707
7....	4.58	872	4.12	610	3.52	660	3.22	204 ^s	3.67	347	4.23	658
8....	4.58	872	4.12	612	3.52	678	3.22	204	3.77	394	4.17	622
9....	4.58	872	4.12	616	3.22	492	3.22	204	3.77	394	4.15	609
10....	4.58	872	4.13	624	3.17	458	3.22	204	3.76	389	4.07	561
11....	4.58	872	4.13	626	3.20	466	3.17	194	3.72	370	4.49	817
12....	4.58	872	4.13	628	3.22	470	3.17	194	3.97	501	4.44	786
13....	4.57	866	4.13	631	3.27	490	3.13	186	4.05	548	4.41 ^b	760
14....	4.54	847	4.11	622	3.28	488	3.13	186	4.00	518	4.25	650
15....	4.50	823	4.11	626	3.33	511	3.13	186	3.97	501	4.17	600
16....	4.50	823	4.11	628	3.35	516	3.21	202	3.92	472	4.09	540
17....	4.50	823	4.11	629	3.34	502	3.25	211	3.87	445	4.03	500
18....	4.50	823	4.13	656	3.31	477	3.45	266	3.87	445	3.79	403
19....	4.50	823	4.13	670	3.30 ^a	463	3.52	288	4.14	603	3.77	390
20....	4.34	725	4.13	684	3.00	317	3.50	281	4.18	628	4.31	640
21....	4.34	725	4.09	683	2.99	304	3.73	374	4.19	634	4.38	640
22....	4.34	725	4.09	698	2.83	246	3.72	370	4.19	634	4.93	630
23....	4.02	530	4.09	720	2.74	218	3.71	365	4.17	622	5.04	630
24....	4.02	530	4.01	688	2.67	200	3.68	351	4.12	591	5.28	630
25....	4.06	555	3.81	588	2.66	192	3.67	347	3.98	507	6.23	620
26....	4.06	555	3.73	558	2.99	273	3.67	347	4.28	689	6.68	620
27....	4.04	542	3.69	552	3.12	310	3.67	347	4.27	683	6.38	610
28....	3.96	495	3.67	558	3.07	282	3.64	334	4.25	670	7.58	600
29....	3.85	434	3.62	550	2.71	184	3.56	303	4.18	628	4.69	230
30....	3.86	440	3.58	542	2.70	176	3.46	269	4.18	628	4.09	230
31....	3.93	478 ^s	3.55	544	.....	.....	3.46	269	.....	.....	3.88 ^b	230

^a Gauge height interpolated.^b Ice conditions, December 13-31.^s Shifting conditions, July 31 to October 7.

MONTHLY DISCHARGE of Cascade river at Bankhead, for 1916

(Drainage area 244 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	370	145	273	1.120	1.29	16,786
February.....	395	310	347	1.420	1.53	19,960
March.....	473	225	388	1.590	1.83	23,857
April.....	526	91	244	1.000	1.12	14,519
May.....	83	48	57	0.238	0.27	3,505
June.....	939	56	423	1.730	1.93	25,170
July.....	908	434	746	3.060	3.53	45,870
August.....	720	488	604	2.480	2.86	37,139
September.....	678	176	426	1.750	1.95	25,349
October.....	374	162	248	1.020	1.18	15,249
November.....	689	269	488	2.000	2.23	29,038
December.....	817	230	580	2.377	2.74	35,663
The year.....	.....	.....	.....	.....	22.46	292,105

MEAN MONTHLY DISCHARGE in Second-feet of Cascade river at Bankhead

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-feet
October		226	278	200	206	202	248	227	13,937
November		166 ^b	290	377	224	238	488	323	19,248
December			314	637	158	166	580	371	22,810
January		149 ^c	166	217	159	273		204	12,528
February		85	140	92	266	347		186	10,500
March		102 ^d	184	98	379	388		262	16,130
April		67	342	90	216	244		192	11,413
May		301	259	122	57	57		159	9,794
June		648	878	890	843	423		736	43,824
July		338	417	625	1,444	746		714	43,899
August	624 ^a	788	583	172	764	604		582	35,798
September	411	289	350	74	235	426		298	17,706
Total in acre-feet	44,259	181,575	253,798	217,638	299,834	248,944			257,587

a 16-31.

b 1-6.

c 1-4 and 8-31.

d 1-21 and 27-31.

BOW RIVER NEAR KANANASKIS

Location.—On the NW. $\frac{1}{4}$ Sec. 32, Tp. 24, Rge. 8, W. 5th Mer., at the Canadian Pacific railway bridge, one mile above the Kananaskis falls (upper) dam of the Calgary Power company.

Records available.—March 10, 1912, to December 31, 1916. Records obtained at Morley, ten miles down stream, from May 25, 1910, to November 30, 1911.

Gauge.—Chain; elevation of zero maintained at 90.84 feet since establishment.

Bench-mark.—On side of east pier; assumed elevation 100.00 feet.

Channel.—Permanent, solid rock, fairly uniform.

Discharge measurements.—Made from the bridge; at very low stages by wading.

Observer.—The Calgary Power company.

Accuracy.—Gauge heights were recorded daily to hundredths of a foot and give a fair average of each day's water level.

The discharges are taken from a curve plotted from a series of open water measurements, which curve passes through ten points out of fourteen; the remaining four points plot very close to this curve and the daily discharges during open water may be considered to be fairly accurate.

The winter discharges are arrived at from a graph based on stream measurements, temperatures and daily gauge heights. The results in January, February and March are fairly reasonable estimates; those in December are not quite as satisfactory, as no measurement could be made during that month owing to the condition of this stream and the insecurity of the ice.

DISCHARGE MEASUREMENTS of Bow river near Kananaskis, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 4	H. C. Ritchie	240	385	1.97	4.28	759
Jan. 27	J. M. Paul	346	372	2.18	4.38	810
Feb. 26	H. C. Ritchie	351	384	2.67	2.08	1,028
Mar. 21	do	361	405	2.84	2.15	1,154
April 12	do	350	373	2.60	2.07	970
May 2	do	347	379	2.73	2.04	1,034
May 23	do	381	527	3.54	2.51	1,865
June 15	do	408	811	5.81	3.26	4,709
June 22	A. B. Cook	440	1,950	10.27	5.96	20,040
June 26	do	427	1,423	8.70	4.76	12,388
July 24	H. C. Ritchie	415	1,056	6.51	3.74	6,876
Aug. 10	do	411	963	6.58	3.60	6,344
Aug. 30	do	412	838	5.69	3.30	4,771
Sept. 18	do	403	685	4.70	2.70	3,219
Oct. 20	do	377	576	3.88	2.48	2,235
Nov. 9	do	363	466	3.66	2.30	1,565
Nov. 30	do				4.28	1,250 ^e
Dec. 21	W. K. Broughton				5.87	1,195 ^e

^e Estimated, from gauge height and winter curve.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Bow river near Kananaskis, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	4.25ab	820	4.26	878	2.27	1,055	2.11	1,122	2.03a	953	2.63	2,492
2....	4.26a	770	4.29	884	2.80	1,070	2.16	1,235	1.98	850	2.65	2,552
3....	4.24a	760	4.29	886	3.01	1,080	2.42	1,884	2.02	932	2.60	2,400
4....	4.28a	760	4.28	895	3.05	1,080	2.48	2,046	2.14	1,190	2.62	2,461
5....	4.25a	760	4.36	895	3.32	1,085	2.24	1,421	2.31	1,592	2.60	2,400
6....	4.20a	760	4.42	905	3.40	1,092	2.22	1,373	2.47	2,019	2.62	2,461
7....	4.23a	759	4.48	920	3.57	1,110	2.49	2,073	2.49	2,073	2.65	2,552
8....	4.25	759	4.47	948	3.66	1,120	2.47	2,019	2.48	2,046	2.58	2,340
9....	4.26	759	4.47	963	3.60a	1,130	2.21	1,349	2.52	2,160	2.80	3,025
10....	4.25	760	4.43	980	3.20a	1,140	2.24	1,421	2.54	2,220	2.90	3,370
11....	4.20	762	4.40	990	2.80a	1,142	2.44	1,938	2.44	1,938	2.92	3,443
12....	4.11	764	4.40	995	2.45a	1,145	2.09	1,079	2.49	2,073	2.85	3,197
13....	4.23	770	4.40	995	2.27	1,150	2.08	1,058	2.51	2,130	2.88	3,301
14....	4.16	780	4.41	990	2.21b	1,155	2.07	1,037	2.43	1,911	2.95	3,552
15....	4.14	800	4.43	992	2.10	1,100	2.09	1,079	2.34	1,671	3.22	4,597
16....	4.16	818	4.40	1,000	2.08	1,058	2.19	1,303	2.30	1,565	3.85	7,370
17....	4.20	836	4.20	1,000	2.05	995	2.21	1,349	2.31	1,592	4.38	10,188
18....	4.23	840	3.70a	1,000	2.03	953	2.16	1,235	2.33	1,644	4.94	13,572
19....	4.18	840	3.30a	1,000	2.07	1,037	2.12	1,145	2.30	1,565	5.54	17,379
20....	4.16	838	2.95a	1,000	2.11	1,122	2.15	1,212	2.40	1,830	5.84	19,284
21....	4.14	820	2.27	1,015	2.15	1,212	2.16	1,235	2.41	1,857	6.14	21,210
22....	4.15a	808	2.16	1,025	2.13	1,168	2.18a	1,280	2.44	1,938	5.93	19,857
23....	4.17	805	2.08	1,030	2.11	1,122	2.16a	1,235	2.50	2,100	5.63	17,950
24....	4.23a	805	2.02	1,030	2.09	1,079	2.11a	1,122	2.45	1,965	5.08	14,453
25....	4.30a	804	2.00	1,027	2.05	995	2.09a	1,079	2.49	2,073	4.88	13,196
26....	4.35	804	1.99	1,028	2.04	974	2.07a	1,037	2.52	2,160	4.73	12,266
27....	4.38	810	2.00	1,028	2.00	890	2.05a	995	2.55	2,250	4.78	12,576
28....	4.38	815	2.10	1,030	2.01	911	2.12a	1,145	2.56	2,280	5.53	17,316
29....	4.39	825	2.12	1,040	2.00	890	2.19a	1,303	2.49	2,073	5.66	18,141
30....	4.38	850	.....	.....	2.02	932	2.03a	953	2.51	2,130	5.48	16,998
31....	4.30	870	.....	.....	2.01	911	.....	.....	2.58	2,340	.....	.....

a Gauge heights interpolated.

b Ice conditions January 1 to March 14.

DAILY GAUGE HEIGHT AND DISCHARGE of Bow river near Kananaskis, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	4.73	12,266	3.22	4,597	3.31	4,967	2.51	2,130	2.40	1,830	5.00	1,330
2....	4.78	12,576	3.27	4,802	3.35	5,133	2.50	2,100	2.46	1,992	3.97	1,350
3....	4.93	13,509	3.44	5,508	3.28	4,843	2.49	2,073	2.33	1,644	3.09	1,320
4....	4.74	12,328	3.49	5,718	3.37	5,215	2.45	1,965	2.32	1,618	2.69	1,290
5....	4.88	13,196	3.52	5,848	3.48	5,676	2.38	1,777	2.40	1,830	3.13	1,330
6....	4.54	11,116	3.44	5,508	3.38	5,257	2.48	2,046	2.37	1,751	3.23	1,340
7....	4.45	10,590	3.35	5,133	3.25	4,720	2.43	1,911	2.30	1,565	3.18	1,336
8....	4.48	10,764	3.30	4,925	3.23	4,638	2.50	2,100	2.39	1,804	3.89	1,330
9....	4.71	12,142	3.36	5,174	3.27	4,802	2.43	1,911	2.31	1,591	4.03	1,330
10....	5.24	15,474	3.60	6,200	3.19	4,475	2.44	1,938	2.39	1,804	5.00	1,336
11....	5.34	16,109	3.48	5,676	3.09	4,077	2.45	1,965	2.27	1,493	6.18	1,340
12....	5.05	14,268	3.35	5,133	3.11	4,155	2.47	2,019	2.80 ^b	1,520	6.30	1,338
13....	5.11	14,649	3.33	5,049	3.02	3,811	2.46	1,992	3.95	1,580	6.56	1,282
14....	5.09	14,521	3.30	4,925	2.94	3,516	2.47	2,019	3.71	1,655	6.99	1,210
15....	4.64	11,714	3.32	5,008	2.88	3,301	2.47	2,019	5.33	1,665	7.08	1,090
16....	4.55	11,175	3.31	4,967	2.83	3,129	2.40	1,830	6.40	1,650	7.13	1,075
17....	4.45	10,590	3.37	5,215	2.75	2,865	2.43	1,911	5.15	1,610	6.90 ^a	1,070
18....	4.54	11,116	3.40	5,340	2.72	2,769	2.43	1,911	5.12	1,540	6.67	1,080
19....	4.50	10,880	3.33	5,050	2.78	2,961	2.49	2,073	3.61	1,490	6.37	1,120
20....	4.45	10,590	3.26	4,761	2.65	2,552	2.49	2,073	4.19	1,590	6.07	1,180
21....	4.46	10,648	3.21	4,556	2.59	2,370	2.48	2,046	4.87	1,590	5.83	1,195
22....	4.51	10,939	3.15	4,315	2.55	2,250	2.46	1,992	3.19	1,580	5.58	1,200
23....	4.46	10,648	3.11	4,155	2.57	2,310	2.47	2,019	2.96	1,410	5.46	1,200
24....	3.75	6,895	3.05	3,925	2.50	2,100	2.48	2,046	3.21	1,430	5.26	1,200
25....	3.57	6,068	3.08	4,039	2.48	2,046	2.47	2,019	3.79	1,437	5.18 ^a	1,200
26....	3.59	6,156	3.05	3,925	2.52	2,160	2.47	2,019	4.03	1,444	5.11	1,200
27....	3.64	6,384	3.11	4,155	2.55	2,250	2.51	2,130	4.76	1,450	5.11	1,190
28....	3.60	6,200	3.33	5,050	2.53	2,190	2.47	2,019	5.50	1,462	5.11	1,185
29....	3.51	5,804	3.27	4,802	2.50	2,100	2.45	1,965	6.33	1,462	5.11	1,173
30....	3.42	5,424	3.30	4,925	2.55	2,250	2.46	1,992	4.28	1,250	5.11	1,140
31....	3.30	4,925	3.25	4,720	.....	.....	2.40	1,830	.....	.....	5.11 ^b	1,118

^a Gauge height interpolated.^b Ice conditions November 12 to December 31.

MONTHLY DISCHARGE of Bow river near Kananaskis, for 1916

(Drainage area 1,630 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January	870	759	798	0.490	0.56	49,067
February	1,040	878	978	0.600	0.65	56,255
March	1,212	890	1,061	0.651	0.75	65,237
April	2,073	953	1,325	0.813	0.91	78,843
May	2,340	880	1,843	1.130	1.30	113,322
June	21,210	2,340	9,197	5.642	6.29	547,260
July	16,109	4,925	10,634	6.520	7.52	653,859
August	6,200	3,925	4,939	3.030	3.49	303,687
September	5,676	2,046	3,496	2.140	2.39	208,026
October	2,130	1,777	1,995	1.220	1.41	122,667
November	1,992	1,250	1,591	0.976	1.09	94,671
December	1,350	1,070	1,228	0.753	0.87	75,507
The year	.....	.....	.....	.....	27.23	2,368,401

SESSIONAL PAPER No. 25a

MEAN MONTHLY DISCHARGE in Second-feet of Bow river near Kananaskis

MONTH	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		2,510	1,840	2,158	2,026	2,128	1,855	1,995	2,073	127,471
Nov.		1,519	1,308 ^c	1,259	1,507	1,218	1,394	1,591	1,415	84,176
Dec.		1,111		656	1,398	645	1,165	1,228	1,034	63,564
Jan.		593 ^b		703	859	654	798		754	46,331
Feb.		615		679	646	803	978		744	41,719
March		687	580 ^d	839	670	825	1,061		816	50,198
April		827	627	1,285	808	1,093	1,325		994	59,159
May	8,473 ^a	2,229	2,200	2,546	2,583	2,570	1,843		2,328	143,168
June	9,544	10,184	5,475	8,776	6,932	5,428	9,197		7,934	472,082
July	7,859	8,059	6,130	5,540	6,957	8,059	10,634		7,605	467,637
August	4,829	5,759	5,923	5,049	3,528	5,134	4,939		5,023	308,995
Sept.	2,794	3,501	3,294	3,381	2,136	2,539	3,496		3,020	179,709
Total in Acre-ft.	1,632,904	2,252,531	1,614,248	1,987,964	1,821,274	1,886,866	2,344,198			2,044,209

^a 25-31.^b 21-31.^c 1-8 and 27-30.^d 10-31.

Note.—Above records previous to March, 1912, taken below mouth of Kananaskis river on Bow river near Morley in Sec. 22, Tp. 55, Rge. 7, W. 5th Mer.
Drainage area for this station is 2,111 square miles.

KANANASKIS RIVER NEAR SEEBE

Location.—On the SW. $\frac{1}{4}$ Sec. 34, Tp. 24, Rge. 8, W. 5th Mer., one and one-half miles above the junction with Bow river.

Records available.—September 1, 1911, to November 11, 1911; January 1, 1912, to December 31, 1916.

Gauge.—Chain; elevation of zero maintained at 88.17 feet since April 20, 1912. Previous to April 20, 1912, gauge readings were at old station, one and one-half miles down stream.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Permanent.

Discharge measurements.—Made from a cable.

Observer.—The Calgary Power Company.

Accuracy.—The gauge records are taken daily at this station to one-hundredth of a foot, at the time of mean daily gauge height.

Discharge measurements were plotted from two curves, which were necessitated by a change at the control during the period of high water between July 24 and August 10. The points plotted are penetrated by either one or other of these two curves with the exception of two points which plot very close to the curve.

The results are well within the limit of error.

The winter discharges are based upon graphs, derived by using the daily gauge heights, occasional measurements and temperature graphs and are fairly good estimates.

DISCHARGE MEASUREMENTS of Kananaskis river near Seebe, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Feb. 26	H. C. Ritchie	80	85	1.38	6.14	117
Mar. 20	do	105	203	0.90	4.76	182
April 13	do	106	208	0.86	4.78	178
May 1	do	111	237	1.15	5.04	272
May 22	do	115	282	1.69	5.46	478
June 14	do	128	476	4.86	7.08	2,312
June 21	A. B. Cook	132	689	8.41	8.73	5,786
June 25	do	126	544	6.69	7.66	3,634
July 24	H. C. Ritchie	127	357	5.63	6.83	2,025
Aug. 10	do	126	324	5.98	6.84	1,612
Aug. 30	do	125	288	4.82	6.63	1,387
Sept. 19	do	121	232	3.85	6.10	893
Oct. 20	do	127	175	2.50	5.42	437
Nov. 10	do	113	155	2.25	5.15	348
Nov. 30	do	99	135	2.05	5.01	276
Dec. 22	W. K. Broughton	127	217	0.76	7.40	166

DAILY GAUGE HEIGHT AND DISCHARGE of Kananaskis river near Seebe, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	7.03 ^b	202	9.24	120	6.19	122	4.71 ^a	163	5.04 ^a	273	5.79	742
2	7.05	197	9.24	119	6.67 ^a	123	4.73 ^a	160	5.08	271	5.83	777
3	7.12	194	8.99	118	7.16 ^a	125	4.74 ^a	172	5.17	332	5.90	840
4	7.19 ^a	191	8.76	117	7.66 ^a	127	4.77 ^a	181	5.19	341	6.16	998
5	7.26 ^a	188	8.74	117	8.16 ^a	130	4.78 ^a	184	5.24	367	6.20	1,140
6	7.33 ^a	184	8.60	117	8.64 ^a	133	4.80 ^a	190	5.28	389	6.30	1,260
7	7.38 ^a	180	8.56	116	9.11	135	4.82 ^a	196	5.26	378	6.30	1,260
8	7.43 ^a	176	8.66	115	9.27	138	4.84 ^a	202	5.27	383	6.27	1,224
9	7.47	172	8.43	115	8.63 ^a	140	4.85 ^a	205	5.44	481	6.55	1,575
10	7.50	168	8.43	114	7.98 ^a	143	4.88 ^a	214	5.43	475	6.65	1,717
11	7.22	163	8.23	113	7.35 ^a	147	4.83 ^a	199	5.40	455	6.57	1,603
12	7.19	166	8.15	114	6.70 ^a	152	4.92	227	5.38	444	6.45	1,442
13	7.47	165	8.00	116	6.06	155	4.88	214	5.42	468	6.51	1,519
14	7.16	160	7.80	119	6.05	158	4.86	208	5.39	450	6.80	1,940
15	7.30	156	8.91	120	5.87	161	4.89	217	5.38	444	7.31	2,809
16	7.33	158	7.89	120	5.17	164	4.90	220	5.36	433	7.92	4,057
17	7.35	158	7.81	119	4.75 ^b	167	4.87	211	5.39	450	9.00	6,325
18	6.93	156	7.29 ^a	119	4.69	158	4.89	217	5.35	428	9.50	7,375
19	6.73	154	6.77 ^a	118	4.71 ^a	163	4.90	220	5.37	438	9.35	7,060
20	6.68	150	6.52 ^a	118	4.74 ^a	172	4.88	214	5.40	455	9.15	6,640
21	6.60	146	6.26	118	4.68 ^a	156	4.84	202	5.40	455	8.75	5,800
22	6.65 ^a	143	6.24	118	4.70	160	4.87	211	5.43	475	8.25	4,750
23	6.70	139	6.16	119	4.74	172	4.89 ^a	217	5.49	514	7.80	3,805
24	7.25 ^a	136	6.06	118	4.72	166	4.90 ^a	220	5.45	487	7.65	3,490
25	7.80 ^a	133	6.80	118	4.71	163	4.92 ^a	227	5.43	475	7.50	3,175
26	8.35 ^a	130	6.13	117	4.72	166	4.94 ^a	234	5.47	501	7.76	3,721
27	8.90	128	6.11	118	4.72	166	4.96 ^a	241	5.48	507	7.73	3,658
28	9.55	126	6.15	120	4.71	163	4.98 ^a	248	5.50	520	8.23	4,708
29	9.50	124	6.20	120	4.71	163	5.00 ^a	255	5.59	583	8.26	4,771
30	9.45	123	.....	.....	4.72	166	5.02 ^a	264	5.64	622	7.86	3,931
31	9.50	122	.....	.....	4.70	160	.....	.....	5.75	710	.....	.....

^a Gauge height interpolated.^b Ice conditions, January 1 to March 17.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Kananaskis river near Seebe, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	7.63	3,448	6.64	1,520	6.59	1,344	5.98	790	5.29	394	5.03	268
2	7.71	3,716	6.65	1,500	6.55	1,302	5.85	697	5.27	385	5.01	260
3	8.05	4,330	6.72	1,560	6.53	1,282	5.78	652	5.28	389	5.00	256
4	7.87	3,952	6.68	1,520	6.96	1,791	5.69	594	5.25	377	4.98	254
5	7.67	3,532	6.70	1,520	7.26	2,228	5.66	578	5.26	381	4.97	250
6	7.33	2,847	6.67	1,470	7.05	1,915	5.66	578	5.23	368	4.95	245
7	7.41	3,000	6.63	1,420	6.80	1,580	5.60	545	5.21	359	4.96	240
8	7.48	3,136	6.57	1,310	6.74	1,511	5.56	524	5.19	351	4.98	232
9	7.50	3,175	6.64	1,380	6.76	1,534	5.53	508	5.16	339	4.99	220
10	7.80	3,805	6.92	1,737 ^s	6.55	1,302	5.51	497	5.10	316	5.37	218
11	7.85	3,910	6.71	1,477	6.51	1,260	5.49	487	5.06	302	6.27	211
12	7.53	3,238	6.58	1,334	6.56	1,313	5.47	477	7.43 ^b	300	6.40	200
13	7.46	3,097	6.62	1,377	6.47	1,220	5.44	462	8.20	300	6.21	196
14	7.53	3,238	6.57	1,224	6.33	1,083	5.43	457	7.87	300	6.45	190
15	7.32	2,828	6.55	1,302	6.30	1,055	5.43	457	7.42	295	6.49	186
16	7.01	2,277	6.52	1,271	6.24	1,004	5.41	447	7.46	295	6.46	185
17	7.05	2,345	6.63	1,388	6.15	927	5.42	452	7.53	295	6.90 ^a	180
18	7.49	3,155	6.69	1,454	6.08	869	5.43	457	6.44	292	7.94	179
19	7.33	2,847	6.76	1,534	6.11	893	5.42	452	5.40	290	7.44	177
20	7.24	2,680	6.77	1,545	6.07	861	5.42	452	5.15	290	6.94	173
21	7.19	2,588	6.70	1,465	6.01	813	5.42	452	5.00	286	6.68	169
22	7.15	2,518	6.65	1,410	6.03	829	5.40	442	5.03	285	7.43	166
23	7.04	2,328	6.71	1,477	5.97	782	5.37	429	5.01	284	7.87	166
24	6.83	1,985	6.86	1,658	5.95	768	5.37	429	4.89	280	8.47	165
25	7.02	2,335 ^s	6.97	1,804	5.97	782	5.33	411	5.00	284	8.87	165
26	6.89	2,100	6.90	1,710	5.90	730	5.36	424	5.01	284	9.47	164
27	6.97	2,200	6.77	1,545	5.95	708	5.33	411	5.05	280	9.02	164
28	7.03	2,265	6.79	1,569	5.98	790	5.33	411	5.07	278	8.43	163
29	6.82	1,900	6.79	1,569	5.96	775	5.32	407	5.03	274	8.69	162
30	6.76	1,760	6.66	1,421	6.06	853	5.29	394	5.05	276	8.31	161
31	6.72	1,660	6.61	1,366	.....	.....	5.29	394	.....	.....	8.93 ^b	160

^a Gauge height interpolated.^b Ice conditions, November 12 to December 31.^s Shifting conditions July 25 to August 10.

MONTHLY DISCHARGE of Kananaskis river near Seebe, for 1916

(Drainage area 392 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January	202	122	158	0.403	0.46	9,715
February	120	113	117	0.298	0.32	6,730
March	172	122	152	0.388	0.45	9,346
April	264	163	211	0.538	0.60	12,555
May	710	273	452	1.153	1.33	27,792
June	7,375	742	3,137	8.003	8.93	186,684
July	4,330	1,660	2,845	7.258	8.37	174,932
August	1,804	1,271	1,482	3.781	4.36	91,125
September	2,228	730	1,139	2.906	3.24	67,775
October	790	394	467	1.191	1.37	28,715
November	394	274	314	0.801	0.89	18,684
December	268	160	198	0.505	0.58	12,175
The year	.....	.....	.....	.....	30.90	646,208

MEAN MONTHLY DISCHARGE in Second-feet of Kananaskis river near Seebe

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		300	376	507	542	480	467	445	27,382
November		152a	252	306	311	328	314	302	17,982
December			204	226	197	266	198	218	13,417
January		136	168	142	97	158		140	8,614
February		129	169	143	145	117		141	7,904
March		129	136	153	133	152		141	8,644
April		128	178	169	200	211		177	10,548
May		477	492	722	921	452		613	37,675
June		1,582	1,712	1,653	1,893	3,137		1,995	118,734
July		1,996	1,245	1,701	2,000	2,845		1,959	120,478
August		1,424	1,277	961	1,363	1,482		1,301	79,283
September		715	653	599	811	1,139		818	48,654
Total in acre-feet	42,545	425,650	431,679	441,492	522,969	652,021			499,315

a 1-11.

GHOST RIVER AT GILLIES' RANCH

Location.—On the NE. $\frac{1}{4}$ Sec. 23, Tp. 26, Rge. 6, W. 5th Mer., one mile above the junction with Bow river.

Records available.—August 17, 1911, to November 11, 1911; January 1, 1912, to December 31, 1916.

Gauges.—Chain, on left bank: Elevation of zero maintained at 91.15 feet, 1911-13; elevation of zero maintained at 89.22 feet from January 1, 1914, to June 26, 1915.

Staff: Elevation of zero maintained at 91.67 feet from June 27, 1915, to June 28, 1916.

Stevens continuous water stage recorder: Elevation of zero maintained at 91.49 feet from June 29, 1916, to December 31, 1916.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Shifting at each high stage.

Discharge measurements.—Made by wading; at high stages made at traffic bridge one mile down stream.

Observer.—Miss E. Gillies.

Accuracy.—The gauge heights are recorded during the winter season to one-hundredth of a foot by an observer.

During the open water season, a continuous water stage recorder is used as a base for computations.

The discharges all plotted on a curve up to June 23, after which date there was a gradual change in the control until the end of the open water season, and the Bolster method was used in obtaining discharges under shifting conditions.

During the winter the discharges were based on a graph formed by the use of daily gauge height temperatures and occasional discharge measurements, which will be found fairly accurate estimates.

From March 10 to 27, no gauge height observations were made and the discharges are estimated.

SESSIONAL PAPER No. 25a

DISCHARGE MEASUREMENTS of Ghost river at Gillies' Ranch, in 1916

Date	Engineer	Width <i>Feet</i>	Area of Section <i>Sq. ft.</i>	Mean Velocity <i>Ft. per sec.</i>	Gauge Height		Discharge <i>Sec.-ft.</i>
					Staff <i>Feet</i>	Auto <i>Feet</i>	
Jan. 6	H. C. Ritchie	20	86.5	1.59	4.28	.....	137
Feb. 4	do	25	36.0	2.80	5.08	.....	100
Mar. 9	do	25	36.0	2.80	6.68	.....	100 ^e
April 11	do	79	96.8	2.97	3.21	.....	284
May 4	do	98	149.0	2.32	3.28	0.99	345
May 25	do	73	87.8	2.70	3.10	0.71	236
June 13	do	78	219.0	2.67	3.57	1.38	586
June 23	A. B. Cook	90	225.0	4.17	4.07	2.26	1,230
July 22	H. C. Ritchie	68	173.0	3.48	.....	2.20	603
Aug. 8	do	98	130.0	3.85	.....	1.83	501
Aug. 29	do	70	241.0	2.93	.....	2.05	706
Sept. 27	do	102	148.0	3.83	.....	2.18	568
Oct. 19	do	99	131.6	4.58	.....	2.02	603
Nov. 6	do	98	107.0	3.32	.....	1.80	356
Nov. 29	do	96	93.3	2.89	.....	1.60	270
Dec. 20	W. K. Broughton	90	104.0	2.00	.....	1.72	207

^e Estimated from velocity and area.

DAILY GAUGE HEIGHT AND DISCHARGE of Ghost river at Gillies' Ranch, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis- charge	Gauge Height	Dis- charge	Gauge Height	Dis- charge	Gauge Height	Dis- charge	Gauge Height	Dis- charge	Gauge Height	Dis- charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	3.88 ^b	160	4.70	103	3.48	102	2.96	187	3.27	325	3.96	1,083
2	3.95	154	4.77	102	3.53	102	3.61	638	3.42	440	3.90	1,000
3	3.95	148	4.77	100	3.53	102	3.71	758	3.27	325	4.22	1,448
4	3.27	144	5.08	100	3.68	102	3.61	638	3.27	325	4.42	1,733
5	3.45	140	5.03	100	6.48	101	3.00	198	3.22	293	4.21	1,434
6	4.28	137	3.88	100	6.53	100	3.41	430	3.07	224	4.06	1,224
7	4.39	136	3.98	102	6.58	100	3.43	449	3.03	209	3.86	948
8	4.45	133	4.90	104	6.58	100	3.49	508	2.97	190	3.92	1,028
9	4.50	131	4.28	106	6.68 ^c	100	3.45	469	2.84	157	3.92	1,028
10	4.56	128	3.86	112	.....	101	3.71	758	2.82	152	3.92	1,028
11	4.92	126	3.72	115	.....	101	3.21	286	2.82	152	3.60	626
12	4.43	124	4.89	118	.....	102	3.16	262	2.82	152	3.60	626
13	4.14	123	4.83	119	.....	102	3.12	244	2.82	152	3.58	604
14	4.15	124	4.82	120	.....	105	3.26	318	2.93	178	3.76	821
15	4.16	127	6.33	120	.....	109	3.37	397	2.93	178	4.23	1,462
16	4.17	133	6.33	120	.....	116	3.11	240	2.95	184	4.57	1,954
17	4.15	135	6.32	120	.....	122	3.35	382	2.93	178	4.49	1,835
18	3.99	135	5.18	119	.....	129	3.10	235	2.94	181	4.50	1,850
19	3.98	134	5.23	118	.....	139	3.09	231	2.89	168	4.47	1,806
20	4.00	132	4.88	116	.....	150	3.11	240	3.03	216	5.77	3,730
21	4.01	126	4.87	114	.....	161	3.05	216	2.96	187	4.79	2,279
22	4.12 ^a	122	4.78	112	.....	173	2.90	170	2.97	190	4.15	1,350
23	4.23 ^a	115	4.73	110	.....	185	2.89	168	3.09	231	4.07	1,238
24	4.34	111	4.34	108	.....	198	2.89	168	3.16	262	3.88	974
25	4.37 ^a	107	4.18	106	.....	215	3.04	213	3.11	240	3.90	1,000
26	4.40 ^a	105	4.13	104	.....	235	3.24	306	3.30	344	3.96	1,083
27	4.44 ^a	105	3.98	103	3.03 ^b	209	3.24	306	3.52	540	4.66	2,087
28	4.47	106	3.90	103	3.09	231	3.24	306	3.56	583	5.66	3,567
29	4.47	106	3.78	103	3.11	240	3.01	202	3.87	961	3.66	2,150 ^s
30	4.44	106	.....	.....	2.91	173	3.18	271	3.92	1,028	2.02	922 ⁿ
31	4.45	105	.....	.....	3.01	202	.....	.....	4.02	1,168	.....	.....

^a Gauge height interpolated.^b Ice conditions—January 1 to March 26.^c Shifting conditions, June 29 to November 5.^s Winter gauge, January 1 to March 9.^m Summer gauge, March 27 to June 29.ⁿ Automatic outside staff gauge, June 29-30.

DAILY GAUGE HEIGHT AND DISCHARGE OF Ghost river at Gillies' Ranch, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	2.53 ^c	1,267	1.98	542	2.14	748	2.13	556	1.85	418	1.65 ^b	270
2....	2.89	1,508	1.97	542	2.26	824	2.11	548	1.87	423	1.70	266
3....	3.13	1,664	2.01	580	3.31	1,584	2.10	548	1.79	374	1.65	260
4....	2.93	1,496	1.99	580	3.04	1,380	2.07	532	1.80	372	1.60	255
5....	2.38	1,072	1.95	555	2.69	1,112	2.08	546	1.83	378 ^s	1.60	245
6....	2.25	960	1.94	556	2.46	938	2.13	592	1.80	357	1.62	232
7....	2.41	1,056	1.86	502	2.37	860	2.09	564	1.80	357	1.61	225
8....	2.69	1,244	1.87	512	2.33	824	2.06	552	1.82	367	1.61	223
9....	2.62	1,172	2.22	790	2.33	814	2.06	558	1.83	372	1.60	223
10....	2.39	980	2.19	770	2.30 ^a	785	2.07	570	1.80	357	1.70	228
11....	2.32	912	2.04	660	2.30 ^a	776	2.08	586	1.76	338	1.70	237
12....	2.39	942	1.96	604	2.29 ^a	762	2.09	600	1.75	334	1.70	238
13....	2.42	940	1.91	568	2.29 ^a	756	2.09	607	1.75	334	1.70	236
14....	2.29	826	1.91	570	2.28 ^a	740	2.09	615	1.65	290	1.70	234
15....	2.25	780	1.89	558	2.28 ^a	733	2.09	623	1.65	290	1.85	231
16....	2.25	760	1.93	590	2.20	668	2.08	622	1.66	294	1.76	227
17....	2.30	776	2.03	668	2.21	665	2.14	672	1.66	294	1.75	223
18....	2.55	938	3.10	1,460	2.18	636	2.09	645	1.66	294	1.75	215
19....	2.46	852	3.23	1,554	2.16	612	2.04 ^m	604	1.70	310	1.85	209
20....	2.34	744	2.60	1,090	2.14	587	2.02 ^c	596	1.70	310	1.72	207
21....	2.16 ^c	595	2.40	924	2.17	606	2.02	593	1.70	310	1.69	196
22....	2.20	604	2.37	924	2.28	678	2.01	582	1.72	319	1.69	195
23....	2.21 ^m	618	2.48	1,008	2.27	667	2.00	570	1.70	310	1.69	194
24....	2.18	607	2.43	970	2.26	653	2.00	563	1.66	294	1.68	192
25....	2.27	686	2.26	848	2.25	638	2.00	556	1.65	290	1.84 ^a	188
26....	2.28	702	2.21	816	2.24	624	2.01	556	1.65	290	1.99	185
27....	2.24	680	2.15	776	2.11	518	2.00	546	1.64	286	2.04	183
28....	2.16	628	2.14	772	2.09	510	1.95	506	1.64	286	2.03	180
29....	2.11	604	2.13	768	2.08	508	1.90	468	1.60	270	2.06	180
30....	2.07	590	2.16	778	2.12	542	1.85	426	1.60	270	2.06	180
31....	2.05	582	2.15	764	.....	.....	1.85	423	.....	.....	2.98 ^{c,b}	180

^a Gauge height interpolated.^b Ice conditions, December 1-31.^c Shifting conditions, June 29 to November 5.^s Automatic, outside, staff gauge July 1-21 and October 20 to December 31.^m Automatic gauge, July 23 to October 19.

MONTHLY DISCHARGE OF Ghost river at Gillies' Ranch, for 1916

(Drainage area 375 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	160	105	126	0.336	0.39	7,747
February.....	120	100	110	0.293	0.30	6,327
March.....	240	100	142	0.379	0.44	8,731
April.....	758	168	340	0.907	1.01	20,231
May.....	1,168	152	326	0.869	1.00	20,045
June.....	3,730	626	1,464	3.904	4.36	87,114
July.....	1,664	582	896	2.389	2.75	55,093
August.....	1,554	502	761	2.029	2.34	46,792
September.....	1,584	508	758	2.021	2.26	45,104
October.....	672	423	565	1.507	1.73	34,740
November.....	423	270	326	0.869	0.97	19,398
December.....	270	180	217	0.579	0.67	13,343
The year.....	.....	.....	.....	.....	18.22	364,665

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of Ghost river at Gillies' ranch

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		291	395	289	227	417	565	364	22,382
November		219b	278	230	194	314	326	268	15,971
December			196	189	113	244	217	192	11,793
January		128	148	128	107	126		127	7,827
February		99	132	107	94	110		108	6,108
March		115	108	113	95	142		115	7,062
April		134	212	143	135	340		193	11,468
May		358	316	169	334	326		301	18,482
June		300	371	268	1,301	1,464		741	44,077
July		1,073	553	278	1,453	896		851	52,301
August	773a	653	428	243	986	761		614	37,766
September	505	545	353	206	574	758		490	29,167
Total in acre-feet	53,048	229,669	211,400	142,977	340,202	356,511			264,394

a 17-31.

b 1-11.

JUMPINGPOUND CREEK NEAR JUMPING POUND

Location.—On the SE. $\frac{1}{4}$ Sec. 30, Tp. 24, Rge. 4, W. 5th Mer., near Jumping Pound post office.

Records available.—April 19, 1908, to October 31, 1916. Discharge measurements only, June, 1906.

Gauge.—Vertical staff attached to bridge pile; elevation of zero has been maintained at 89.82 feet since establishment.

Bench-mark.—Permanent iron bench-mark on right bank; assumed elevation 100.00 feet.

Channel.—Permanent.

Discharge measurements.—At high water, made from highway bridge; at ordinary stage by wading down stream.

Winter flow.—No winter records have been obtained.

Observer.—John Bateman.

DISCHARGE MEASUREMENTS of Jumpingpound creek near Jumping Pound, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 10	H. C. Ritchie	78.0	80.0	1.61	2.46	129
May 5	do	65.0	91.0	1.62	2.48	147
June 12	do	107.5	292.0	2.46	3.24	717
June 24	A. B. Cook	89.0	240.0	2.03	2.95	487
July 21	H. C. Ritchie	64.0	86.0	1.56	2.27	134
Aug. 7	do	52.0	69.0	1.04	2.09	72
Aug. 28	do	74.0	117.0	2.43	2.67	284
Sept. 20	do	73.0	104.0	1.76	2.43	182
Oct. 18	do	74.0	106.5	1.73	2.40	184
Nov. 8	do	63.0	52.4	2.34	2.12	123

DAILY GAUGE HEIGHT AND DISCHARGE of Jumpingpound creek near Jumping Pound, for 1916

DAY	April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			2.20	112	4.13	1,931
2.....			2.60	256	4.43	2,408
3.....			2.50	212	4.63	2,728
4.....			2.56	238	4.68	2,808
5.....			2.46	197	4.13	1,931
6.....			2.43	186	3.88	1,550
7.....			2.39	172	3.78	1,403
8.....			2.35	158	3.83	1,476
9.....			2.33	152	3.85	1,506
10.....	2.46	197	2.32	149	3.81	1,447
11.....	2.46	197	2.29	139	3.53	1,060
12.....	2.46	197	2.27	133	3.54	1,073
13.....	2.47	201	2.28	136	3.34	833
14.....	2.46	197	2.32	149	3.74	1,344
15.....	2.46	197	2.34	155	3.99	1,715
16.....	2.46	197	2.32	149	4.24	2,104
17.....	2.36	162	2.34	155	4.39	2,184
18.....	2.32	149	2.45	194	4.40	2,360
19.....	2.29	139	2.50	212	4.30	2,200
20.....	2.26	130	2.48	205	4.15	1,962
21.....	2.21	115	2.46	197	4.10	1,884
22.....	2.19	110	2.56	238	3.40	900
23.....	2.18	107	2.61	261	3.13	617
24.....	2.15	100	2.69	303	2.81	372
25.....	2.13	94	2.81	372	2.86	404
26.....	2.13	94	2.85	398	2.86	404
27.....	2.14	97	2.96	474	3.06	555
28.....	2.14	97	3.91	1,595	3.96	1,670
29.....	2.16	102	3.62	1,178	3.85	1,506
30.....	2.19	110	3.62	1,178	4.15	1,962
31.....			4.12	1,915		

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Jumpingpound creek near Jumping Pound, for 1916
—Concluded

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	3 15	636	2 21	115	2 63	272	2 35	158
2	3 20	683	2 17	105	2 65	282	2 40	175
3	3 20	683	2 17	105	3 13	617	2 45	194
4	3 15	636	2 18	107	5 13	3,528	2 45	194
5	3 09	580	2 13	95	5 33	3,848	2 40	175
6	2 99	497	2 11	90	4 98	3,288	2 35	158
7	2 94	460	2 10	87	4 54	2,584	2 33	152
8	3 04	538	2 19	110	4 14	1,946	2 29	139
9	2 89	424	2 74	331	3 64	1,205	2 29	139
10	2 74	331	2 64	277	3 34	833	2 33	152
11	2 68	298	2 64	277	3 14	627	2 35	158
12	2 65	282	2 44	190	3 04	538	2 36	162
13	2 63	272	2 34	155	2 79	360	2 33	152
14	2 61	261	2 32	149	2 74	331	2 31	145
15	2 58	247	2 29	139	2 64	277	2 30	142
16	2 52	221	2 27	133	2 56	238	2 29	139
17	2 47	201	2 22	118	2 54	230	2 29	139
18	2 47	201	3 32	810	2 52	221	2 28	136
19	2 42	182	5 14	3,544	2 49	208	2 33	152
20	2 34	155	3 94	1,640	2 47	201	2 31	145
21	2 26	130	3 64	1,205	2 45	194	2 33	152
22	2 26	130	3 49	1,009	2 40	175	2 30	142
23	2 24	124	3 43	936	2 35	158	2 29	139
24	2 21	115	3 33	822	2 33	152	2 28	136
25	2 23	121	3 13	617	2 30	142	2 28	136
26	2 27	133	2 93	452	2 31	145	2 28	136
27	2 32	149	2 78	354	2 30	142	2 27	133
28	2 30	142	2 68	298	2 29	139	2 27	133
29	2 30	142	2 63	272	2 29	139	2 26	130
30	2 25	127	2 58	247	2 31	145	2 26	130
31	2 28	136	2 53	225			2 25	127

MONTHLY DISCHARGE of Jumpingpound creek near Jumping Pound, for 1916

(Drainage area 187 square miles.)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April (10-30)	201	94	142	0.759	0.59	5,913
May	1,915	112	373	2.000	2.31	22,935
June	2,808	372	1,543	8 250	9.20	91,815
July	683	115	298	1.590	1.83	18,323
August	3,544	87	484	2.590	2.99	29,760
September	3,848	139	772	4 130	4.61	45,937
October	194	127	148	0.791	0.91	9,100
The period					22.44	223,783

MEAN MONTHLY DISCHARGE in Second-feet of Jumpingpound creek near Jumping Pound

MONTH	1907-8	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		a40	20.0	16.5	c115	105 d95	26.0	26	129	148	67	4,129
November.....												
December.....												
January.....												
February.....												
March.....												
April.....												
May.....												
June.....												
July.....												
August.....												
September.....												
Total in acre-feet....	35,714	39,689	10,341	67,181	94,741	52,701	21,274	171,062	222,615			80,613

a 1-26.

b 9-30.

c 1-19.

d 1-15.

e 15-30.

f 4-30.

g 15-31.

h 10-30.

BOW RIVER NEAR COCHRANE

Location.—On the SW. $\frac{1}{4}$ Sec. 35, Tp. 25, Rge. 4, W. 5th Mer., near Cochrane post office.

Records available.—May 4, 1916, to July 11, 1916.

Gauge.—Vertical staff attached to the downstream end of the third pier from the left bank. Elevation of zero has been maintained at 88.60 since establishment.

Bench-mark.—Small bolt on downstream side of fourth pier from left bank; assumed elevation 100.00 feet.

Channel.—Permanent.

Discharge measurements.—From highway bridge.

Floods.—The stream was in flood June 21, maximum gauge height 6.33. The stream did not overflow its banks.

Winter measurements.—None made. This station is maintained during high water only, for the purpose of issuing flood warnings.

Observer.—Geo. P. Ratray.

Remarks.—As this station is only maintained during high water and for flood prediction purposes, daily and monthly discharges are not prepared or published.

DISCHARGE MEASUREMENTS of Bow river near Cochrane, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 27.....	H. C. Ritchie.....	345	851	4.04	0.55	5,440
June 14.....	do.....	368	1,352	5.89	2.00	7,962
June 20.....	A. B. Cook.....	420	2,907	9.68	5.77	28,130
June 24.....	do.....	402	2,315	8.87	4.41	20,528

SESSIONAL PAPER No. 25a

BOW RIVER AT CALGARY

Location.—On the NE. $\frac{1}{4}$ Sec. 15, Tp. 24, Rge. 1, W. 5th Mer., at Langevin traffic bridge on 4th St. E., in the city of Calgary.

Records available.—May 5, 1908, to December 31, 1916.

Gauges.—Standard chain type on Langevin bridge; elevation of zero maintained at 3,405.37 feet during 1912-1916. Gurley automatic gauge on central pier; elevation of zero maintained at 3,405.37 feet during 1914-1916.

Bench-mark.—Zero of staff gauge embedded in concrete of centre pier is 3,409.98 feet. This is referred to a bench-mark of the Topographical Surveys Branch on the northeast wing wall of the bridge, the elevation of which is 3,428.99 feet.

Channel.—Coarse gravel, shifting in floods.

Discharge measurements.—Made from bridge.

Observer.—C. L. Lang.

Accuracy.—Gauge heights at this station are read daily to one-hundredth of a foot, and are accurate.

The open water discharge curve passes through nine points, and in close proximity to all the remainder, and the discharges are all well within the limit of error. The curve is smooth and well defined.

The winter discharges are based on a graph, which is, in its turn, based upon daily gauge heights, temperatures and frequent measurements and would be considered fair estimates.

DISCHARGE MEASUREMENTS of Bow river at Calgary, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 4-5.....	F. K. Beach.....				4.94	1,000e
Jan. 17.....	O. H. Hoover.....	318	1,184	0.62	8.04	729
Feb. 2.....	do.....	340	966	1.44	8.56	1,392
Mar. 3.....	S. H. Frame.....	290	595	1.79	6.43	1,065
Mar. 18.....	E. J. Switzer.....	305	826	1.85	6.80	1,524
April 8.....	O. H. Hoover.....	305	666	3.33	5.24	2,219
April 28-29.....	W. K. Broughton.....	287	641	2.54	4.07	1,628
May 19.....	do.....	306	682	2.78	4.40	1,897
June 2.....	do.....	313	1,262	4.55	5.84	5,745
June 19.....	W. H. Storey.....	356	2,882	7.66	9.94	22,076
June 20.....	do.....	356	3,008	7.87	10.24	23,673
June 21.....	do.....	356	3,082	8.93	10.54	27,536
June 22.....	W. K. Broughton.....	360	2,870	8.50	10.04	24,393
June 24.....	do.....	356	2,517	7.66	8.99	19,284
June 27.....	R. J. McGuinness.....	358	2,705	8.15	9.63	22,040
July 11.....	W. K. Broughton.....	337	2,682	7.82	8.95	20,971
July 21.....	do.....	335	2,189	5.92	7.51	12,761
July 22.....	do.....	334	2,123	5.70	7.30	12,102
July 31.....	R. J. McGuinness.....	324	1,650	4.49	6.15	7,409
Aug. 23.....	W. K. Broughton.....	326	1,824	4.60	6.49	8,389
Sept. 13.....	do.....	323	1,705	4.00	6.02	6,813
Oct. 3.....	do.....	300	1,354	2.84	4.90	3,849
Oct. 27.....	do.....	292	1,299	2.49	4.64	3,232
Nov. 21.....	do.....	278	1,192	2.10	4.32	2,502
Dec. 7.....	do.....	253	1,113	1.31	4.02	1,458
Dec. 27.....	C. M. O'Neil.....	219	860	0.87	4.31	744

e Discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Bow river at Calgary, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	<i>b</i>	1,040	.....	1,380	.....	1,100	4.68	2,130	4.06	2,100	6.09	7,266
2.....	.....	1,030	8.52	1,390	.....	1,070	4.99 ^a	2,160	4.28	2,466	5.96	6,828
3.....	4.89	1,040	8.60	1,370	6.43	1,065	5.30	2,170	4.25	2,415	6.26	7,868
4.....	4.91	1,050	8.27	1,330	.....	1,080	4.80	2,170	4.35	2,590	6.46	8,628
5.....	5.26	1,100	8.37 ^a	1,320	.....	1,130	4.62	2,180	4.43	2,737	6.37	8,286
6.....	4.86	1,110	8.48 ^a	1,320	.....	1,200	5.47	2,180	4.61	3,102	6.16	7,504
7.....	5.06	1,120	8.59	1,330	.....	1,240	5.30	2,210	4.66	3,212	6.08	7,232
8.....	5.50	1,150	8.54 ^a	1,340	6.77	1,260	5.16	2,220	4.76	3,438	6.06	7,164
9.....	5.67 ^a	1,180	8.49	1,345	6.57	1,300	5.23	2,220	4.66	3,212	6.14	7,436
10.....	5.84	1,200	8.50 ^a	1,350	6.85	1,375	5.26 ^b	2,230	4.59	2,959	6.29	7,982
11.....	5.64	1,180	8.51	1,355	7.67	1,450	4.06	2,100	4.54	2,954	6.14	7,436
12.....	5.37	1,140	8.40 ^a	1,350	.....	1,480	4.08	2,130	4.39	2,662	6.09	7,266
13.....	5.69	1,060	8.30	1,320	.....	1,490	4.05	2,050	4.39	2,662	6.03	7,062
14.....	6.05	930	8.45 ^a	1,315	.....	1,500	4.00	2,010	4.34	2,572	6.23	7,944
15.....	6.66	800	8.60 ^a	1,330	.....	1,510	4.07	2,115	4.32	2,536	6.06	10,564
16.....	7.36	750	8.75 ^a	1,355	.....	1,510	3.90	1,880	4.26	2,432	7.89	14,505
17.....	8.04	730	8.90	1,370	.....	1,520	3.94	1,932	4.25	2,415	8.72	18,240
18.....	.....	750	8.00	1,360	6.80	1,525	3.94	1,932	4.34	2,572	9.49	21,741
19.....	.....	1,000	7.80	1,330	.....	1,565	3.92	1,966	4.39	2,662	10.09	24,873
20.....	.....	1,200	7.49	1,275	.....	1,650	3.93	1,929	4.54	2,954	10.14	25,158
21.....	.....	1,240	.....	1,230	.....	1,780	3.93	1,929	4.59	2,959	10.46	27,078
22.....	.....	1,245	.....	1,220	.....	1,825	3.87	1,841	4.68	3,256	10.04	24,588
23.....	.....	1,250	.....	1,200	.....	1,855	3.89	1,867	4.67	3,234	9.44	21,496
24.....	.....	1,250	.....	1,180	.....	1,875	3.84	1,802	4.81	3,553	8.94	19,230
25.....	.....	1,255	.....	1,150	.....	1,900	3.88	1,854	4.84	3,622	8.68	18,060
26.....	.....	1,260	.....	1,130	.....	1,930	3.78	1,724	4.84	3,622	8.76	18,420
27.....	.....	1,260	.....	1,100	.....	1,975	3.93	1,919	4.89	3,737	9.45	22,040 ^s
28.....	.....	1,270	.....	1,100	.....	2,000	3.99	1,997	4.96	3,904	9.86	23,600
29.....	.....	1,300	.....	1,100	.....	2,020	4.07	2,115	5.79	6,269	9.91	23,990
30.....	.....	1,340	.....	.....	.....	2,050	3.92	1,906	6.06	7,164	9.45	21,580
31.....	.....	1,370	.....	.....	.....	2,080	.....	.....	6.09	7,266	.....	.....

^a Gauge height interpolated.^b Ice conditions, January 1 to April 10.^s Shifting conditions, June 27 to July 20.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Bow river at Calgary, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	8.97	19,815	6.14	7,436	6.17	7,538	5.02	4,052	4.42	2,718	4.20	2,440
2....	8.91	19,680	6.20	7,640	6.24	7,792	4.98	3,952	4.43	2,737	4.22	2,460
3....	9.27	21,447	6.28	7,944	6.35	8,210	5.62	5,742	4.36	2,608	4.19	2,420
4....	9.36	21,986	6.32	8,096	7.64	13,412	4.82	3,576	4.37	2,626	4.15	2,175
5....	9.16	21,165	6.24	7,792	7.47	12,694	4.78	3,484	4.37	2,626	4.20	2,020
6....	8.57	19,095	6.11	7,334	7.17	11,434	4.82	3,576	4.35	2,590	4.19	1,750
7....	8.31	17,565	6.06	7,164	6.88	10,252	4.78	3,484	4.37	2,626	4.08	1,460
8....	8.38	18,015	6.03	7,062	6.58	9,084	4.72	3,346	4.26	2,432	4.15	1,450
9....	8.77	19,905	6.35	8,210	6.33	8,134	4.68	3,256	4.28	2,466	4.24	1,460
10....	8.94	20,805	6.56	9,008	6.27	7,906	4.67	3,234	4.32	2,536	4.15	1,460
11....	8.96	20,985	6.45	8,590	6.10	7,300	4.65	3,190	4.08	2,130	4.12	1,490
12....	8.73	19,770	6.28	7,944	5.97	6,861	4.62	3,124	3.66	1,572	4.18	1,535
13....	8.60	19,005	6.08	7,232	6.02	7,028	4.69	3,080	3.58	1,480	4.31	1,610
14....	8.58	18,780	6.03	7,062	5.96	6,828	4.62	3,124	3.60	1,500	4.58	1,655
15....	8.34	17,430	5.95	6,795	5.87	6,531	4.61	3,102	4.39	2,662	4.42	1,650
16....	7.86	15,180	6.03	7,062	5.76	6,176	4.62	3,124	4.38	2,644	4.55	1,625
17....	7.81	14,820	6.08	7,232	5.66	5,866	4.66	3,212	4.34	2,572	4.63	1,670
18....	8.13	16,080	7.96	14,820	5.58	5,618	4.66	3,212	4.23	2,381	4.67	1,700
19....	8.15	15,990	7.47	12,694	5.50	5,370	4.86	3,668	4.32	2,536	4.71a	1,710
20....	7.83	14,415b	6.92	10,408	5.47	5,277	4.85	3,645	4.28	2,466	4.75a	1,720
21....	7.52	12,904	6.52	8,856	5.37	4,979	4.81	3,553	4.32	2,536	4.79a	1,740
22....	7.27	11,854	6.36	8,248	5.27	4,709	4.76	3,438	4.41	2,699	4.84a	1,760
23....	7.05	10,930	6.46	8,628	5.23	4,601	4.72	3,346	4.23	2,381	4.89	1,780
24....	6.86	10,174	6.56	9,008	5.19	4,494	4.74	3,392	3.97	1,971	5.13	1,750
25....	6.63	9,277	6.56	9,008	5.19	4,494	4.69	3,278	4.22b	2,350	4.87	1,625
26....	6.60	9,160	6.51	8,818	5.19	4,494	4.64	3,168	4.23	2,420	5.11	1,175
27....	6.61	9,199	6.39	8,362	5.02	4,052	4.64	3,168	4.24	2,440	4.31	745
28....	6.52	8,856	6.28	7,944	5.03	4,078	4.60	3,080	4.27	2,490	4.62	1,080
29....	6.41	8,438	6.24	7,792	5.03	4,078	4.52	2,912	4.21	2,480	5.09	1,625
30....	6.24	7,792	6.18	7,572	5.03	4,078	4.49	2,851	4.14	2,440	4.97	1,655
31....	6.16	7,504	6.14	7,436	.....	.....	4.50	2,870	.....	.....	4.90b	1,650

a Gauge height interpolated.

b Ice conditions, November 25 to December 31.

* Shifting conditions, June 27 to July 20.

MONTHLY DISCHARGE of Bow river at Calgary, for 1916

(Drainage area 3,136 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	1,370	730	1,116	0.356	0.41	68,620
February.....	1,390	1,100	1,284	0.409	0.44	73,856
March.....	2,080	1,065	1,558	0.497	0.57	95,798
April.....	2,230	1,724	2,028	0.647	0.72	120,674
May.....	7,266	2,100	3,330	1.062	1.22	204,750
June.....	27,078	6,828	14,702	4.688	5.23	874,830
July.....	21,986	7,504	15,420	4.917	5.67	948,139
August.....	14,820	6,795	8,350	2.665	3.07	513,975
September.....	13,412	4,052	6,778	2.161	2.41	403,319
October.....	5,742	2,851	3,395	1.083	1.25	208,750
November.....	2,737	1,480	2,404	0.767	0.86	143,048
December.....	2,460	745	1,680	0.536	0.62	103,300
The year.....	.....	.....	.....	.....	22.47	3,759,059

MEAN MONTHLY DISCHARGE in Second-feet of Bow river at Calgary

MONTH	1907-8	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
Oct.		b2,400	2,423	3,094	2,424	3,064	2,635	2,772	2,680	3,395	2,811	173,080
Nov.			d1,880	f1,205	1,600	2,076	1,951	1,767	1,746	2,404	1,926	114,584
Dec.				1,205	774	955	1,794	1,111	1,269	1,680	1,250	77,457
Jan.				ø880	1,109	1,118	1,054	1,225	1,116		1,124	69,137
Feb.				914	1,048	1,124	945	1,197	1,284		1,085	61,048
Mar.				857	1,030	1,192	1,034	1,400	1,558		1,178	72,463
April.		c1,354	e1,952	1,292	1,571	1,663	1,498	1,605	2,028		1,610	95,772
May.	a5,955	4,176	6,683	2,676	3,432	3,201	3,700	4,459	3,330		3,957	243,316
June.	13,702	14,527	10,427	11,434	8,185	11,557	10,208	10,440	14,702		11,687	695,410
July.	10,801	12,263	7,961	9,459	10,772	7,651	9,045	14,470	15,420		10,938	672,559
Aug.	5,652	5,879	5,279	7,396	8,169	6,825	4,750	8,305	8,359		6,735	414,058
Sept.	3,648	3,703	3,441	4,452	4,847	4,561	2,926	4,115	6,778		4,275	254,353
Total in. acre-feet	2,303,927	2,619,924	2,313,943	2,623,802	2,728,834	2,721,974	2,552,537	3,207,923	3,650,670	.....	.....	2,943,237

- a 10-31.
b 1-28.
c 20-30.
d 1-6.
e 6-30.
f 29-30.
g 1-4 and 21-30.

ELBOW RIVER AT FULLERTON'S RANCH

Location.—On the NW. $\frac{1}{4}$ Sec. 12, Tp. 23, Rge. 5, W. 5th Mer., at E. R. Fullerton's ranch, thirty-five miles southwest of Calgary.

Records available.—September 29, 1914, to December 31, 1916.

Gauge.—Vertical staff on right bank; zero elevation maintained at 90.33 feet during 1914 and January 1915. Standard chain on log traffic bridge about 300 feet down stream from staff; zero elevation maintained at 85.40 feet during 1914 and from January 1 to June 26, 1915. Vertical staff on left bank opposite staff on right bank; zero elevation maintained at 90.83 feet from July 20, 1915, to December 31, 1916.

Bench-mark.—Permanent iron bench-mark, on left bank near staff; assumed elevation 100.00 feet.

Channel.—Boulders, fairly permanent.

Discharge measurements.—Made by wading or from bridge.

Floods.—Bridge and all gauges carried away on June 26, 1915, and June 16, 1916.

Observer.—E. R. Fullerton.

Remarks.—No discharge measurements were obtained between May 27, 1916, and September 19, 1916, as the bridge has been washed away and this stream remained too high to wade during the summer. A cable station has now been erected and will be used in 1917.

DISCHARGE MEASUREMENTS of Elbow river at Fullerton's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		Feet	Sq.-ft.	Ft. per sec.	Feet	Sec.-ft.
Jan. 7.	F. K. Beach.	118	234	0.51	3.06	118
Feb. 3.	H. C. Ritchie.	60	33	1.35	3.14	45
Mar. 10.	do.	60	45	1.62	3.70	73
Mar. 23.	do.	100	95	2.08	1.09	197
April 10.	do.	90	101	3.23	1.29	291n
May 5.	do.	113	151	3.12	1.54	470
May 26.	do.	112	136	2.73	1.45	372
Sept. 19.	do.	105	151	3.94	1.03	594
Oct. 17.	do.	102	132	3.56	0.86	470
Nov. 7.	do.	100	104	2.98	0.71	309
Nov. 28.	do.	94	90	2.70	0.61	242
Dec. 18.	W. K. Broughton.	107	142	2.14	2.07	303

n Discharge was measured at a miscellaneous section 6 miles below gauge.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Elbow river at Fullerton's ranch, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	2.80 ^b	104	3.33	46	1.97	114	1.09	202	1.36	328	1.88	.....
2....	2.80	105	3.23	45	1.77	105	1.09	202	1.48	390	2.05	.....
3....	2.70	107	3.24	45	1.77	90	1.09	202	1.58	442	2.58	.....
4....	2.70	111	3.24	45	1.67	75	1.11	210	1.63	468	2.68	.....
5....	3.01	115	3.22	45	1.57	65	1.34	318	1.57	436	2.63	.....
6....	2.91	116	3.19	47	1.72	66	1.38	338	1.54	421	2.53	.....
7....	3.06	118	3.14	50	2.67	68	1.39	343	1.54	421	2.71	.....
8....	3.11	117	3.14	55	2.62	70	1.37	333	1.52	410	2.68	.....
9....	3.07	112	3.14	60	3.17	72	1.34	318	1.55	426	2.58	.....
10....	2.92	109	3.14	66	3.70	73	1.29	293	1.55	426	2.63	.....
11....	3.02	108	3.19	75	4.01	74	1.27	284	1.42	358	2.48	.....
12....	3.07	108	3.30	85	3.42	81	1.18	241	1.42	358	2.38	.....
13....	3.08	103	3.43	95	3.17	86	1.18	241	1.40	348	2.51	.....
14....	3.73	98	3.45	102	2.72	95	1.18	241	1.38	338	2.68	.....
15....	3.53	93	3.55	110	2.67	106	1.20	250	1.37	333	2.93	.....
16....	3.73	89	3.78	120	2.17	118	1.18	241	1.36	328	3.18	.....
17....	3.54	82	3.55	135	1.72	131	1.18	241	1.36	328	4.16	.....
18....	3.54	77	3.80	148	1.61	144	1.23	264	1.35	323	2.63	.....
19....	3.54	73	3.40	155	1.56	156	1.21	255	1.35	323	2.78	.....
20....	3.54	68	2.80	156	1.45	167	1.23	264	1.35	323	2.13	.....
21....	3.46	65	2.81	157	1.35 ^b	178	1.24	269	1.36	328	2.73	.....
22....	3.45	63	2.81	155	1.10	206	1.28	288	1.37	335	2.33	.....
23....	3.44	60	2.56	151	1.09	202	1.28	288	1.42	358	2.28	.....
24....	3.38	58	2.56	145	1.07	195	1.28	288	1.47	384	2.18	.....
25....	3.36	56	2.44	141	1.04	184	1.26	279	1.48	390	2.08	.....
26....	3.46	54	2.38	137	1.04	184	1.31	303	1.53	416	2.33	.....
27....	3.49	52	2.38	131	1.04	184	1.38	338	1.73	.....	3.13	.....
28....	3.52	50	2.16	126	1.04	184	1.36	328	2.05	.....	2.98	.....
29....	3.47	49	1.96	121	1.04	184	1.33	313	1.93	.....	2.78	.....
30....	3.37	48	.....	.....	1.06	192	1.31	303	1.85	.....	2.58	.....
31....	3.37	47	.....	.....	1.07	195	.....	.....	1.88	.....	.....	.....

^b Ice conditions, January 1 to March 21

DAILY GAUGE HEIGHT AND DISCHARGE of Elbow river at Fullerton's ranch, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	2.23		0.99		1.21		0.84	465	0.86	474	0.98	231
2	2.93		0.99		1.18		0.82	455	0.86	474	1.28	224
3	2.73		1.01		1.58		0.82	455	0.86	474	0.98	219
4	2.38		1.03		2.38		0.82	455	0.86	474	0.93	215
5	2.08		1.01		2.23		0.84	465	0.85	469	0.83	208
6	1.98		0.99		2.03		0.84	465	0.80 ^b	380	0.83	204
7	1.93		0.98		2.01		0.84	465	0.71	309	0.83	202
8	1.91		0.96		2.48		0.87	480	0.70	303	0.84	202
9	1.83		1.53		2.38		0.86	474	0.70	307	0.84	205
10	1.76		1.43		2.38		0.86	474	0.70	305	0.99	208
11	1.71		1.35		2.13		0.86	474	0.70	304	1.04	209
12	1.63		1.23		2.05		0.85	469	0.70	302	1.04	211
13	1.61		1.11		1.57		0.85	469	0.69	300	1.14	215
14	1.58		1.08		1.31		0.85	469	0.69	298	1.29	222
15	1.53		1.03		1.23		0.85	469	0.69	295	1.39	235
16	1.43		1.00		1.13		0.85	469	0.69	293	1.49	254
17	1.38		0.98		1.08		0.88	484	0.68	291	1.80	280
18	1.33		2.38		1.08		0.86	474	0.68	287	2.07	303
19	1.31		2.35		1.03	561	0.86	474	0.68	284	2.19	309
20	1.28		1.93		1.03	561	0.86	474	0.67	280	2.15	300
21	1.23		1.98		1.01	550	0.86	474	0.67	276	2.06	260
22	1.22		1.98		0.98	535	0.87	480	0.66	273	2.11	200
23	1.18		2.03		0.98	535	0.87	480	0.66	269	2.11	180
24	1.13		1.98		0.98	535	0.87	480	0.65	265	2.17	174
25	1.11		1.83		0.96	525	0.86	474	0.64	260	2.27	169
26	1.07		1.63		0.93	509	0.85	469	0.64	253	2.57	166
27	1.03		1.53		0.91	499	0.86	474	0.62	246	2.33	162
28	1.03		1.43		0.88	484	0.86	474	0.61	242	2.68	160
29	1.02		1.35		0.87	480	0.86	474	0.65	239	3.33	158
30	1.01		1.28		0.83	460	0.85	469	0.88	235	3.49	160
31	1.00		1.24				0.85	469			3.59 ^b	175

^b Ice conditions, November 6 to December 31.

MONTHLY DISCHARGE of Elbow river at Fullerton's ranch, for 1916

(Drainage area 254 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-ft.
January	118	47	84	0.331	0.38	5,165
February	157	45	102	0.402	0.43	5,867
March	206	65	130	0.511	0.59	7,993
April	343	202	276	1.087	1.21	16,423
May (1-26)	468	323	374	1.472	1.42	19,287
June						
July						
August						
September (19-30)	561	460	520	2.047	0.91	12,377
October	484	455	471	1.854	2.14	28,960
November	474	235	316	1.244	1.39	18,803
December	309	158	214	0.843	0.97	13,158
The period					9.44	128,033

SESSIONAL PAPER No: 25b

ELBOW RIVER AT CALGARY

Location.—On the SW. $\frac{1}{4}$ Sec. 14, Tp. 24, Rge. 1, W. 5th Mer., city corporation yard, at foot of Thirteenth avenue east, Calgary.

Records available.—May 8, 1908, to December 31, 1916.

Gauges.—Standard chain on Twelfth avenue bridge; elevation of zero maintained at 3,404.82 feet during 1915-16. Vertical staff at metering section 700 feet up stream from bridge; elevation of zero maintained at 3,406.95 during 1915-16.

Bench-marks.—(1) Permanent iron bench-mark on left bank near cable station; elevation 3,423.85 feet above mean sea-level. (Geodetic Surveys of Canada.) (2) Permanent bench-mark on corner of Twelfth avenue east; elevation 3,420.07 feet above mean sea-level. (Geodetic Surveys of Canada.)

Channel.—Composed of coarse gravel and boulders, liable to shift and affected by backwater from the Bow river during flood stages of that stream.

Discharge measurements.—Made from a cable car, or in low water by wading.

Observers.—Mrs. I. S. White and John Nicol.

Accuracy.—Gauge heights were read to one-hundredth of a foot at a time of mean daily gauge height.

There were two curves used during the open water season: one for chain gauge readings up to May 2, and the other for staff gauge from May 2 to the end of the season.

Both curves pass through nine points out of fourteen measurements, three points plot very close to the curve and two had no bearing on the curve, as the gauge heights were affected by back water from the Bow river in its high stage.

The curve is regular and well defined and the daily discharges are satisfactory and well within the limit of error.

Ice conditions obtained from January 1 to April 10, and from November 10 to December 31, during which period discharges were based upon daily gauge heights, discharge measurements and temperature graphs, and are fairly close estimates.

DISCHARGE MEASUREMENTS of Elbow river at Calgary, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 26.....	O. H. Hoover.....	70	109	1.01	3.37 _x	110
Feb. 28.....	S. H. Frame.....	55	75	2.73	2.36 _x	204
Mar. 20.....	E. J. Switzer.....	90	104	2.77	4.28 _x	288
April 7.....	O. H. Hoover.....	132	315	1.70	2.41 _x	534
May 2.....	W. K. Broughton.....	143	271	1.36	1.68	370
May 26.....	do.....	141	327	2.04	2.24	668
June 7.....	do.....	148	569	3.92	3.70	2,224
June 17.....	A. B. Cook.....	148	732	5.37	4.97	3,933
June 21.....	W. K. Broughton.....	143	809	4.84	5.67 _c	3,912
June 27.....	do.....	141	655	4.35	4.46 _c	2,850
June 29.....	R. J. McGuinness.....	143	885	5.82	5.67	5,150
July 20.....	W. K. Broughton.....	132	334	2.80	2.52	936
Aug. 1.....	do.....	141	316	1.74	2.04	548
Aug. 21.....	do.....	148	505	3.52	3.51	1,780
Sept. 16.....	do.....	144	357	2.12	2.42	759
Oct. 3.....	do.....	142	314	1.62	2.01	501
Nov. 1.....	do.....	141	300	1.50	1.89	449
Nov. 17.....	do.....	140	286	1.18	1.82	337
Dec. 8.....	do.....	138	229	0.76	1.65 _x	175
Dec. 28.....	C. M. O'Neill.....	92	92	1.06	1.41 _x	98

c Gauge height affected by backwater from Bow river.

x Chain gauge.

DAILY GAUGE HEIGHT AND DISCHARGE of Elbow river at Calgary, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	3.72 ^{bc}	66	3.16	114	2.53	201	2.38	523	1.92 ^c	367	3.97	2,430
2....	4.03	97	3.16	116	2.64	200	2.97	790	1.67 ^s	367	3.72	2,105
3....	4.24	107	3.16	117	2.75	199	2.72	660	1.85	438	3.85	2,270
4....	3.96	109	3.20	118	2.91	198	2.42	538	2.03	537	4.07	2,564
5....	3.85	105	3.29	119	3.11	197	2.20	460	1.98	506	4.33	2,929
6....	3.60	96	3.23	120	2.77	197	2.31	499	1.91	466	3.98	2,443
7....	3.85	108	3.23	121	2.62	198	2.40	530	1.85	438	3.72	2,105
8....	3.64	111	3.37	122	2.47	200	2.37	520	1.83	429	3.94	2,389
9....	3.56	107	3.34	123	2.35	201	2.25	478	1.75	397	3.95	2,403
10....	3.37	103	3.33	124	2.87	203	2.20	460	1.73	389	4.02	2,497
11....	3.34	98	3.31	126	5.21	206	2.19	457	1.71	382	3.64	2,008
12....	3.31	91	3.28	128	6.64	212	2.17	450	1.66	364	3.52	1,868
13....	3.36	94	3.30	134	5.70	223	2.16	446	1.61	346	3.50	1,845
14....	3.38	100	3.34	154	5.09	242	2.22	467	1.57	333	3.62	1,989
15....	3.36	107	3.42	174	4.72	262	2.30	495	1.58	336	3.93	2,375
16....	3.28	113	4.01	189	4.53	280	2.13	436	1.61	346	5.20	4,320
17....	3.26	116	4.04	199	4.31	289	2.07	415	1.63	353	4.97	3,929
18....	3.25	118	3.36	206	4.15	295	2.00	393	1.61	346	5.12	4,184
19....	3.23	120	4.00	210	4.19	294	2.02	400	1.68	371	5.22	4,354
20....	3.24	120	3.78 ^a	211	4.27	288	2.03	403	1.73	389	4.87	3,760
21....	3.24	118	3.57	212	4.73	286	1.95	376	1.75	397	4.96 ^a	3,912
22....	3.33	117	3.42	212	5.11	287	1.95	376	1.84	434	4.48	3,150
23....	3.34	115	3.25	211	3.97	292	1.95	376	1.82	425	3.94	2,389
24....	3.36	114	3.07	210	2.94	300	1.94	373	2.06	555	3.67	2,044
25....	3.34 ^a	112	2.91	208	2.32	314	1.96	380	2.12	593	3.40	1,730
26....	3.31 ^a	110	2.70	206	2.28	327	1.93	370	2.24	673	3.58	1,937
27....	3.28 ^a	110	2.45	205	2.13	340	1.93	370	2.28	701	4.27 ^a	2,843
28....	3.25 ^a	112	2.36	204	1.97	360	1.92	367	2.56	905	4.78	3,613
29....	3.22 ^a	112	2.42	203	1.87	382	1.92	367	3.72	2,105	5.67	5,141
30....	3.19	113	.....	.....	1.91	420	1.92	367	4.61	3,346	4.38 ^s	2,929
31....	3.16	114	.....	.....	1.95 ^b	440	.....	.....	3.91	2,349	.....	.....

b Ice conditions, January 1 to March 31.

a Gauge height interpolated.

c Chain gauge, January 1 to May 1. s Staff gauge, May 2 to June 30.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Elbow river at Calgary, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	3.97 ^a	2,430	2.04	543	2.39	778	1.98	506	1.90	460	2.05	239
2....	3.94	2,389	2.00	518	2.33	736	1.97	501	1.89	456	2.03	238
3....	4.10	2,605	2.02	530	2.29	708	2.01	524	1.88	451	2.09	235
4....	4.64	3,392	1.99	512	4.44	3,090	2.01	524	1.87	447	2.07	224
5....	3.96	2,416	2.04	543	4.52	3,210	2.03	537	1.86	443	1.95	213
6....	3.59	1,948	2.02	530	3.80	2,205	2.03	537	1.85	438	1.95	200
7....	3.42	1,753	2.00	518	3.44	1,776	2.03	537	1.82	425	1.91	187
8....	3.49	1,833	1.98	506	3.02	1,320	2.02	530	1.77	405	1.90	175
9....	3.54	1,891	2.37	764	2.90	1,200	2.02	530	1.74	393	1.90	172
10....	3.47	1,811	2.83	1,133	2.83	1,133	2.01	524	1.77 ^s	405	1.82	169
11....	3.32	1,638	2.73	1,042	2.79	1,096	2.00	518	2.11 ^{bc}	335	1.80	167
12....	3.13	1,432	2.38	771	2.69	1,007	1.99	512	2.16	336	2.01	215
13....	3.05	1,350	2.23	666	2.65	975	1.97	501	2.04	335	1.79	195
14....	2.98	1,280	2.18	632	2.56	905	1.94	483	2.09	333	1.72	184
15....	2.76	1,069	2.15	612	2.48	845	1.94	483	2.06	333	1.98	213
16....	2.54	890	2.10	580	2.39	778	1.93	477	2.10	335	1.97	213
17....	2.77	1,078	2.08	568	2.35	750	1.94	483	2.14	337	1.72	183
18....	2.80	1,105	2.78	1,087	2.31	722	1.99	512	2.14 ^a	334	1.66	191
19....	2.75	1,060	4.18	2,717	2.28	701	2.09	574	2.15 ^a	333	1.90	199
20....	2.52	875	3.93	2,375	2.24	673	2.10	580	2.16 ^a	332	1.89	196
21....	2.48	845	3.51	1,857	2.20	645	2.07	561	2.16 ^a	326	1.69	183
22....	2.35	750	3.39	1,718	2.15	612	2.03	537	2.17 ^a	322	1.63	179
23....	2.28	701	3.65	2,020	2.12	593	2.00	518	2.18 ^a	317	1.60	175
24....	2.25	680	3.49	1,833	2.08	568	1.98	506	2.19	310	1.68	167
25....	2.36	757	3.22	1,527	2.05	549	1.97	501	2.10	300	1.69	157
26....	2.40	785	2.94	1,240	2.04	543	1.97	501	1.96	287	1.47	155
27....	2.45	823	2.83	1,133	2.01	524	1.97	501	1.95	268	1.45	130
28....	2.31	722	2.73	1,042	1.99	512	1.97	501	1.95	256	1.32	98
29....	2.19	639	2.59	927	1.98	506	1.95	489	1.95	247	1.38	100
30....	2.01	524	2.52	875	1.97	501	1.94	483	1.94	240	1.37	102
31....	1.95	489	2.44	815	.....	.....	1.91	466	.....	.....	1.36 ^{bc}	105

^a Gauge height interpolated.^b Ice conditions, November 11 to December 31.^s Staff gauge used July 1 to November 10. ^c Chain gauge, November 11 to December 31.

MONTHLY DISCHARGE of Elbow river at Calgary, for 1916

(Drainage area 466 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	120	66	108	0.232	0.27	6,641
February.....	212	114	165	0.354	0.38	9,491
March.....	440	197	269	0.577	0.67	16,540
April.....	790	367	452	0.970	1.08	26,896
May.....	3,346	333	658	1.412	1.63	40,459
June.....	5,141	1,730	2,815	6.041	6.74	167,505
July.....	3,392	489	1,354	2.906	3.35	83,254
August.....	2,717	506	1,037	2.225	2.56	63,763
September.....	3,210	501	1,005	2.157	2.41	59,802
October.....	580	466	514	1.103	1.27	31,605
November.....	460	240	351	0.753	0.84	20,886
December.....	239	98	179	0.384	0.44	11,006
The year.....	.....	.....	.....	.....	21.64	537,848

MEAN MONTHLY DISCHARGE in Second-feet of Elbow river at Calgary

MONTH	1907-8	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
Oct.		245	231	292	367	332	247	336	558	514	347	21,329
Nov.		b236		206	212	150	230	174	299	351	232	13,769
Dec.				119	100	118	138	121	186	179	137	8,439
Jan.				62	106	93	115	126	108		102	6,252
Feb.				96	120	126	110	105	165		120	6,778
Mar.				141	129	107	113	157	269		153	9,391
April.			101	236	263	406	255	218	452		276	16,415
May	a694	968	309	407	461	538	396	1,198	658		617	37,926
June	2,266	1,377	466	915	937	695	691	2,127	2,815		1,365	81,251
July	700	930	282	633	1,589	476	453	1,930	1,354		927	56,972
Aug.	333	431	288	982	554	559	255	907	1,037		594	36,518
Sept.	281	256	422	700	403	320	199	656	1,005		471	28,042
Total in acre-feet.	248,113	261,009	127,055	289,765	317,776	237,029	193,500	488,359	537,890			323,082

a 8-31.

b 1-12.

NOSE CREEK AT CALGARY

Location.—On the SW. $\frac{1}{4}$ Sec. 35, Tp. 24, Rge. 1, W. 5th Mer., about one-quarter mile west of Canadian Pacific railway, Calgary-Edmonton branch, and at bridge on 36th avenue north, city of Calgary.

Records available.—April 24, 1911, to November 18, 1916.

Gauge.—Vertical staff; fastened to a pile of the bridge, near right bank; elevation of zero maintained at 90.60 feet from May 3, 1916, to November 18, 1916. Elevation of zero at old station was maintained at 92.81 feet from establishment on April 24, 1911, to May 2, 1916.

Bench-mark.—Permanent iron bench-mark, fifteen feet southwest of bridge; assumed elevation 100.00 feet.

Channel.—Fairly permanent.

Discharge measurements.—Made from a bridge or by wading.

Observers.—C. A. Lang and J. Haigh.

Remarks.—Previous to May 3, 1916, the station on Nose creek was situated on the NW. $\frac{1}{4}$ Sec. 13, Tp. 24, Rge. 1, W. 5th Mer., near the confluence of the creek with the Bow river, and was transferred to its present location on May 3, 1916.

DISCHARGE MEASUREMENTS of Nose creek at Calgary, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 10.	O. H. Hoover.	24	55	1.64	2.47	90z
May 3.	W. K. Broughton.	30	45	1.33	2.53	61
May 26.	do	36	76	2.20	3.54	168
June 1.	do	52	174	4.09	5.82	712
July 6.	do	42	131	3.64	5.01	477
Aug. 2.	do	29	46	1.35	2.69	62
Aug. 10.	do	34	66	2.29	3.39	150
Aug. 19.	do	49	205	4.16	6.48	852
Sept. 6.	do	45	164	4.03	5.61	660
Oct. 4.	do	34	68	1.97	3.21	134
Nov. 2.	do	35	85	1.09	3.04	93

z Measurement at old station. New station established May 3.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE OF Nose creek at Calgary, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			3.00a		2.72	137	2.01a	53	5.82	688
2.....			3.04a		3.17	269	2.06a	55	5.04a	493
3.....			3.18a		3.12	251	2.53	61	4.42	342
4.....			3.35a		3.12	251	2.47	57	3.89	226
5.....			3.45a		3.12	251	2.38	52	3.88	225
6.....			3.53a		2.72	137	2.36	51	3.89	226
7.....			3.58a		2.66	124	2.27	46	3.56	172
8.....			3.65a		2.51	98	2.20	43	3.35	144
9.....			3.77a		2.46	91	2.18	42	3.22	127
10.....			3.88		2.46	91	2.16	41	3.28	135
11.....			4.03		2.36	80	2.18	42	3.29	136
12.....			4.03		2.26	71	2.21	44	3.17	121
13.....			3.81a		2.26	71	2.23	44	3.01	104
14.....			3.50a		2.21	67	2.22	44	2.93	96
15.....			3.40a		2.18	64	2.24	45	2.85	88
16.....			3.40a		2.16	63	2.24	45	2.78	81
17.....			3.50a		2.11a	59	2.23	44	2.73	77
18.....	4.39b		3.61a		2.09a	57	2.23	44	2.68	72
19.....	4.19		3.78a		2.01a	53	2.23	44	2.69	73
20.....	4.10a		3.88		1.96a	50	2.19	43	3.03	106
21.....	4.00a		4.18		1.93a	48	2.14	41	3.11	114
22.....	3.87a		3.93		1.87a	44	2.42	54	2.99	102
23.....	3.77a		3.72		1.81a	42	2.51	60	2.89	92
24.....	3.70a		3.47		1.79a	40	3.10	113	3.33	141
25.....	3.62		3.12		1.76a	39	3.72	197	3.35	144
26.....	3.58		3.02a		1.78a	40	3.57	174	3.09	112
27.....	3.50		2.92b		1.81a	42	3.51	165	4.39	335
28.....	3.34		2.72	137	1.95a	49	3.07	110	4.67	402
29.....	3.00a		2.72	137	2.03a	54	4.23	298	4.13	276
30.....			2.72	137	1.98a	51	5.37	576	3.87	223
31.....			2.72	137	2.05a	55	7.60	1,155	.....	.....

a Gauge height interpolated.*b* Ice conditions, February 18 to March 27.

DAILY GAUGE HEIGHT AND DISCHARGE of Nose creek at Calgary, for 1916—*Concluded*

DAY	July		August		September		October		November	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	3.41	151	2.73 ^a	77	3.63	183	3.16	120	2.93	96
2.....	3.58	175	2.70	74	3.50	164	3.15	119	3.15 ^b	93
3.....	4.03	254	2.73	77	3.64	184	3.27	133	3.01	.....
4.....	6.85	946	2.92	95	4.93	466	3.23	129	3.08	.....
5.....	6.09	756	2.85	88	6.28	803	3.27	133	3.08	.....
6.....	5.07	500	2.74	78	5.73	666	3.33	141	2.85	.....
7.....	4.92	463	2.68	72	5.13	516	3.34	142	2.74	.....
8.....	4.71	411	2.67	72	4.37	330	3.26	132	2.96	.....
9.....	4.43	344	3.09	112	4.16	282	3.17	121	3.04	.....
10.....	3.97	242	3.42	153	3.48	161	3.11	114	2.62	.....
11.....	3.59	177	3.08	111	3.43	154	3.09	112	2.89	.....
12.....	3.37	146	2.90	93	3.48	161	3.05	108	2.98	.....
13.....	3.15	119	2.84	87	3.70	194	3.03	106	2.84	.....
14.....	3.06	109	2.74	78	3.60	178	2.99	102	2.82	.....
15.....	2.98	101	2.66	71	3.42	153	2.99	102	2.83	.....
16.....	2.93	96	2.66	71	3.36	145	2.98	101	2.87	.....
17.....	2.95	98	2.74	78	3.28	135	3.05	108	2.93	.....
18.....	3.35	144	3.46	158	3.24	130	3.13	117	3.30 ^{mb}	.....
19.....	3.29	136	6.55	870	3.17	121	3.19	124	.....	.....
20.....	3.13	117	6.40	833	3.14	118	3.33	141	.....	.....
21.....	2.94	97	5.46	598	3.10	113	3.45	157	.....	.....
22.....	2.87	90	4.78	428	3.10	113	3.49	163	.....	.....
23.....	2.84	87	4.08	265	3.07	110	3.46	158	.....	.....
24.....	2.79	82	3.78	208	3.02	105	3.43	154	.....	.....
25.....	3.10	113	3.47	139	2.97	100	3.44	156	.....	.....
26.....	3.32	140	3.26	132	3.08	111	3.40	150	.....	.....
27.....	3.16	120	3.16	120	3.06	109	3.33	141	.....	.....
28.....	3.09	112	3.06	109	3.00	103	3.15	119	.....	.....
29.....	2.94	97	3.00	103	2.97	100	3.11	114	.....	.....
30.....	2.82	85	2.96	99	3.04	107	3.09	112	.....	.....
31.....	2.77	80	3.00	103	.....	.....	3.05	108	.....	.....

^a Gauge height interpolated.^b Ice conditions, November 2-18.^m Observations discontinued for season on November 18.

MONTHLY DISCHARGE of Nose creek at Calgary, for 1916

(Drainage area 308 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (28-31).....	137	137	137	0.445	0.07	1,087
April.....	269	39	90	0.292	0.34	5,534
May.....	1,155	41	125	0.406	0.47	7,686
June.....	688	72	189	0.614	0.68	11,246
July.....	946	80	213	0.692	0.80	13,097
August.....	870	71	183	0.594	0.68	11,252
September.....	803	100	210	1.007	1.12	12,496
October.....	163	102	127	0.412	0.48	7,809
November (1-2).....	96	93	94	0.305	0.02	373
The period.....	.....	.....	.....	.....	4.66	70,580

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of Nose creek at Calgary

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		7.4	32.0	10.8	10.3	108	127	49	3,029
November.....		5.8 ^b	17.5 ^d				94 ^h		
December.....									
January.....									
February.....									
March.....		78.0 ^c				137 ^g			
April.....	12.4 ^a	30.0	81.0 ^e		11.8	90		44	2,670
May.....	21.0	37.0	56.0	9.9 ^f	34.0	125		55	3,360
June.....	30.0	17.5	44.0	15.5	140.0	189		73	4,328
July.....	8.7	45.0	38.0	7.7	312.0	213		104	6,401
August.....	14.4	28.0	18.3	4.4	344.0	183		99	6,064
September.....	9.8	55.0	15.0	5.5	137.0	210		72	4,289
Total in acre-feet.....	5,245	14,404	16,351	3,259	60,246	69,039			30,141

a 24-30.

b 1-15.

c 26-31.

d 1-15.

e 10-30.

f 7-31.

g 28-31.

h 1-2.

CANADIAN PACIFIC RAILWAY COMPANY CANAL AT OGDEN

Location.—On the N.E. $\frac{1}{4}$ Sec. 21, Tp. 23, Rge. 29, W. 4th Mer., one-half mile south of Ogden post office and about six miles below the headgates of the main canal "A."

Records available.—May 1, 1911, to September 26, 1916, and at station two miles up stream from May 8, 1908, to October 9, 1910.

Gauge.—Vertical staff in wooden bay of C.P.R. automatic gauge cabin on left bank of canal at end of bridge No. 3. Elevation of zero maintained at 86.65 feet during 1915-1916.

Bench-mark.—An iron post in left bank and two feet from lower end of left abutment of wooden traffic bridge about one hundred feet down stream from section. Assumed elevation 100.00 feet.

Channel.—Fairly permanent.

Discharge measurements.—Made from bridge.

Co-operation.—Gauge heights supplied by Canadian Pacific Railway Company.

DISCHARGE MEASUREMENTS of Canadian Pacific Railway Company canal at Ogden, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 3.....	W. K. Broughton.....	53.0	99.8	1.58	1.69	158
May 23.....	do.....	55.0	117.5	1.60	1.93	188
July 3.....	do.....	58.5	155.7	1.71	2.61	266
July 28.....	do.....	59.5	163.3	1.70	2.67	278
Aug. 24.....	do.....	62.0	221.0	1.81	3.54	399
Sept. 22.....	do.....	56.5	139.4	1.43	2.27	200

DAILY GAUGE HEIGHT AND DISCHARGE of Canadian Pacific Railway Company canal at Ogden,
for 1916

DAY	April		May		June		July		August		September	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			1.51	119	1.01	69	2.68	278	2.02	179	2.74	287
2.....			1.58	127	1.01	69	2.79	296	2.06	184	2.57	261
3.....			1.97	172	1.01	69	1.96	171	2.16	198	2.46	244
4.....			1.84	157	1.00	68	Dry	Nil	2.17	200	2.10	190
5.....			1.91	165	1.00	68			2.18	201	1.25	92
6.....			2.17	200	Dry	Nil	"	"	2.00	176	1.63	132
7.....			2.06	184	"	"	1.58	127	2.02	179	1.56	125
8.....			2.16	198	"	"	1.96	171	2.03	180	1.51	119
9.....			2.13	194	"	"	1.88	162	2.08	187	1.90	164
10.....			2.09	189	0.63	41	1.97	172	2.13	194	2.13	194
11.....			2.15	197	0.89	59	2.48	247	2.14	196	2.70	281
12.....			2.08	187	1.01	69	2.49	249	2.10	190	2.64	271
13.....			2.07	186	1.17	84	2.47	245	2.07	186	2.18	201
14.....			2.08	187	1.14	81	2.45	242	2.04	182	2.15	197
15.....			2.08	187	1.17	84	2.26	212	2.02	179	2.12	193
16.....	0.85	56	2.08	187	1.46	114	1.85	158	2.01	177	2.10	190
17.....	0.93	62	2.08	187	1.45	112	1.42	109	2.03	180	2.07	186
18.....	1.07	75	2.12	193	1.23	90	1.34	101	2.09	189	2.13	194
19.....	1.13	80	2.09	189	1.41	108	1.31	98	1.98	173	2.14	196
20.....	1.27	94	2.07	186	1.44	111	1.49	117	1.79	151	2.19	203
21.....	1.27	94	2.11	192	1.46	114	1.58	127	2.16	198	2.18	201
22.....	1.32	99	2.11	192	0.68	45	1.65	135	2.16	198	2.14	196
23.....	1.58	127	2.13	194	0.80	53	1.44	111	2.27	214	2.12	193
24.....	1.65	135	2.18	201	1.83	156	1.42	109	3.28	384	2.11	191
25.....	1.62	131	2.05	183	1.59	128	1.64	133	2.04	182	2.07	186
26.....	1.72	142	1.95	170	0.72	47	2.25	211	2.06	184	1.06	73
27.....	1.60	129	2.06	184	Dry	Nil	2.11	192	2.04	182		
28.....	1.60	129	2.11	191	1.14	81	1.87	160	2.09	189		
29.....	1.60	129	2.02	179	1.14	81	1.75	146	2.09	189		
30.....	1.60	129	1.83	156	1.26	93	1.96	171	2.09	189		
31.....			1.53	121			1.96	171	2.30	218		

MONTHLY DISCHARGE of Canadian Pacific Railway Company canal at Ogden, for 1916

MONTH	DISCHARGE IN SECOND-FEET			Total Dis-charge in Acre-feet
	Maximum	Minimum	Mean	
April (16-30).....	135	56	107	3,184
May.....	201	119	179	11,006
June.....	156	Nil	70	4,165
July.....	296	"	156	9,592
August.....	384	151	194	11,929
September (1-26).....	287	73	191	9,850
The period.....				49,726

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of Canadian Pacific Railway Company canal at Ogden

MONTH	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		222 <i>b</i>			22 <i>h</i>				
November.....									
December.....									
January.....									
February.....									
March.....									
April.....	192 <i>a</i>	39 <i>c</i>	140 <i>e</i>	249 <i>g</i>	143 <i>i</i>		107 <i>k</i>		
May.....	184	150	138	238	186	239	179	188	11,545
June.....	228	256	229	194	457	249	70	240	14,308
July.....	552	269	179	229	271	351	156	287	17,626
August.....	367	144	189	123	361	159	194	220	13,498
September.....	221	230 <i>d</i>	210 <i>f</i>	283	313	152 <i>j</i>	191 <i>l</i>	272	15,840
Total in acre-feet.....	94,950	67,097	58,625	67,131	99,562	69,312	49,726		72,817

a 27-30.*b* 1-10.*c* April 30.*d* 1-28.*e* 23-30.*f* 1-28.*g* 26-30.*h* 1.*i* 19-30.*j* 1-28.*k* 16-30.*l* 1-26.

1910.

1911-13.

1914—Up to July 1 and after Sept. 21.

1914—July 1 to Sept. 21.

1915-16.

Records obtained at Head-gates.

" " " Ogden.

" " " Head-gates.

" " " Ogden.

" " " Ogden.

FISH CREEK NEAR PRIDDIS

Location.—On S.W. $\frac{1}{4}$ Sec. 26, Tp. 22, Rge. 3, W. 5th Mer., at the Percival ranch which is about one mile north of Priddis post office.

Records available.—May 13, 1907, to October 31, 1916.

Gauge.—Vertical staff, replaced by chain gauge, August 25, 1916. Zero elevation maintained at 91.24 feet during 1907-10. Zero elevation maintained at 90.81 feet during 1911-16.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Not liable to shift except in extreme high water.

Discharge measurements.—By wading or from traffic bridge, about one mile up stream or from cable suspension bridge at the station.

Winter flow.—Observations discontinued during winter months.

Floods.—The largest recorded discharge at this station took place June 26, 1915, when the water elevation was 98.81 feet with an estimated flow of 7,056 sec.-ft.

Observer.—Fred Percival.

DISCHARGE MEASUREMENTS of Fish creek near Priddis, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. Feet</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-Feet</i>
April 6.....	J. M. Paul.....	66	93.6	1.87	5.23	175
May 5.....	W. M. Edwards.....	45	39.5	1.64	2.22	65
June 22.....	R. J. McGuinness.....	53	135.0	1.40	2.92	189
July 27.....	W. M. Edwards.....	43	38.2	1.58	2.15	60
Aug. 25.....	do.....	52	125.0	1.03	2.62	128
Oct. 25.....	W. H. Hannan.....	51	111.0	0.83	2.47	91

DAILY GAUGE HEIGHT AND DISCHARGE of Fish creek near Priddis, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1			4.94	1,396	2.38	82	5.31	1,771
2			5.80	2,350	2.42	88	5.00	1,450
3			5.39	1,859	2.42	88	6.06	2,710
4			5.43	1,903	2.46	94	6.98	4,272
5			5.46	1,936	2.30	71	5.11	1,560
6			5.22	1,672	2.47	96	5.06	1,510
7			5.21	1,661	2.11	50	4.31	877
8			5.21	1,661	2.11	50	4.14	758
9			4.59	1,092	2.10	49	4.02	682
10			4.40	940	2.10	49	3.99	664
11			4.10	730	2.08	47	3.68	490
12	6.54	3,468	3.20	280	2.08	47	3.34	336
13	6.90	4,120	3.00	220	2.08	47	3.32	328
14	6.90	4,120	3.00	220	2.08	47	3.20	280
15	6.71	3,768	3.20	280	1.98	37	3.11	253
16	6.56	3,502	3.20	280	2.06	45	3.08	244
17	6.56	3,502	3.20	280	2.11	50	3.02	226
18	6.44	3,304	3.10	250	2.11	50	2.92	196
19	6.41	3,256	2.78	157	2.10	49	2.71	141
20	6.33	3,128	2.76	153	2.10	49	2.74	148
21	6.27	3,032	2.76	153	2.08	47	3.16	268
22	6.27	3,032	2.58	115	2.15	54	3.01	223
23	5.78	2,324	2.58	115	2.35	78	3.11	253
24	5.74	2,272	2.47	96	3.06	238	2.56	111
25	5.62	2,124	2.47	96	3.06	238	2.65	129
26	5.51	1,992	2.44	91	3.34	336	4.02	682
27	5.48	1,958	2.44	91	3.35	340	5.08	1,530
28	5.48	1,958	2.38	82	3.37	348	5.58	2,076
29	5.22	1,672	2.38	82	3.60	450	4.16	772
30	4.98	1,432	2.38	82	3.71	505	3.18	274
31	4.96	1,414			4.74	1,216		

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Fish creek near Priddis, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	3.18	274	1.99	38	2.60	119	2.14	53
2	3.46	384	1.81	24	2.57	113	2.24	64
3	3.38	352	1.80	23	2.56	111	2.22	61
4	4.25	835	1.84	26	4.21	807	2.20	59
5	4.08	718	2.22	61	5.60	2,100	2.18	57
6	3.07	241	2.22	61	5.60	2,100	2.46	94
7	3.04	232	2.12	51	3.20	280	2.49	98
8	2.87	182	2.10	49	3.64	470	2.47	96
9	2.80	162	2.72	144	3.66	480	2.36	79
10	2.69	137	3.07	241	3.61	455	2.43	90
11	2.67	133	2.64	127	2.04	43	2.47	96
12	2.47	96	2.52	104	2.84	173	2.46	94
13	2.45	92	2.08	47	3.00	220	2.40	85
14	2.43	90	2.04	43	2.13	52	2.42	88
15	2.42	88	1.80	23	2.22	61	2.31	72
16	2.21	60	1.82	25	2.23	63	2.29	70
17	2.21	60	1.82	25	2.49	98	2.26	66
18	2.19	58	2.98	214	2.46	94	2.32	74
19	2.18	57	6.04	2,680	2.35	78	2.34	77
20	2.17	56	4.43	964	2.30	71	2.33	75
21	2.09	48	3.75	525	2.28	69	2.39	84
22	2.04	43	3.24	296	2.20	59	2.42	88
23	2.04	43	3.08	244	2.17	56	2.42	88
24	2.00	39	2.82	168	2.06	45	2.42	88
25	2.14	53	2.62	123	2.13	52	2.43	90
26	2.20	59	2.31	72	2.04	43	2.51	102
27	2.15	54	2.37	81	2.04	43	2.49	98
28	2.15	54	2.46	94	2.02	41	2.21	60
29	2.00	39	2.57	113	2.10	49	2.41	86
30	2.00	39	2.56	111	2.09	48	2.09	48
31	2.00	39	2.56	111	.....	.....	2.23	63

MONTHLY DISCHARGE of Fish creek near Priddis, for 1916

(Drainage area 109 square miles)

MONTH	DISCHARGE IN SECOND-FeET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (12-31)	4,120	1,414	2,769	25.400	18.88	109,818
April	2,350	82	677	6.210	6.93	40,284
May	1,216	37	162	1.490	1.72	9,961
June	4,272	111	840	7.700	8.59	49,983
July	4,835	39	155	1.420	1.64	9,531
August	2,680	23	222	2.040	2.35	13,650
September	2,100	41	283	2.600	2.90	16,840
October	102	48	79	0.725	0.84	4,858
The period					43.86	254,925

MEAN MONTHLY DISCHARGE in Second-feet of Fish creek near Priddis

MONTH	1907-8	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
Oct.		22.0	6.80	6.8	37.0	54.0	16.9	17.0	122	79	40	2,473
Nov.					c24.0	e34.0						
December ..												
Jan.												
Feb.												
Mar.								A953.0	i2,769			
April.				57.0	d56.0	f33.0	g35.0	99.0	677		278	16,518
May.		b241.0	7.80	68.0	76.0	97.0	28.0	214.0	162		93	5,727
June.	a229.0	59.0	7.20	56.0	57.0	81.0	37.0	547.0	840		211	12,523
July.	54.0	70.0	0.48	63.0	250.0	42.0	17.3	711.0	155		151	9,307
Aug.	16.7	15.8	1.50	125.0	76.0	29.0	5.1	190.0	222		76	4,652
Sept.	9.5	6.7	17.00	52.0	63.0	16.4	3.5	140.0	283		66	3,902
Total in . . . acre-feet.	13,954	24,412	2,462	25,941	35,462	21,061	8,140	148,507	257,568			55,102

a 11-30.

b 3-31.

c 1-16.

d 22-30.

e 1-15.

f 21-30.

g 7-30.

h 15-31.

i 12-31.

NORTH BRANCH OF SHEEP RIVER NEAR MILLARVILLE

Location.—On SW. $\frac{1}{4}$ Sec. 12, Tp. 21, Rge. 3, W. 5th Mer., at Malcolm T. Miller's ranch about one and one-half miles east of Millarville post office.

Records available.—May 22, 1908, to October 31, 1916.

Gauge.—Vertical staff. Elevation of zero maintained at 3,822.67 feet during 1908-10. Elevation of zero maintained at 3,821.40 feet during 1911-16.

Bench-mark.—Permanent iron bench-mark. Elevation 3,838.73 (Dominion Western Railway datum) located 36 feet southwest of the NE. corner of Sec. 2, Tp. 21, Rge. 3, W. 5th Mer., and about 300 feet west of the gauge.

Discharge measurements.—Made at the traffic bridge about one mile down stream on the road allowance on the east boundary of Sec. 12 or at a wading station, 200 feet down stream from the gauge.

Winter flow.—Observations not taken during winter months.

Diversions.—The headgates of Malcolm T. Miller's irrigation ditch are about 2 miles above station, but during recent years this ditch has not been used.

Observer.—Malcolm T. Miller.

DISCHARGE MEASUREMENTS of North Branch, Sheep river, near Millarville, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 6.	J. M. Paul.	111	271	0.75	3.57	203
May 5.	W. M. Edwards. . .	112	261	0.97	3.32	253
June 21.	R. J. McGuinness . .	114	408	2.08	4.99	849
July 26.	W. M. Edwards. . .	77	185	0.61	2.71	112
Aug. 25.	do.	104	394	1.18	3.27	465
Oct. 24.	W. H. Hannon.	83	293	0.60	2.64	176

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of North Branch, Sheep river, near Millarville, for 1916

DAY	March		April		May		June	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			3.43	277	3.23	212	5.17	926
2.....			3.58	318	3.32	232	5.88	1,250
3.....			3.38	264	3.32	244	6.19	1,391
4.....			3.63	333	3.32	246	6.05	1,328
5.....			3.33	251	3.39	266	6.25	1,419
6.....			3.58	208 ^a	3.27	236	4.80	758
7.....			3.58	216	3.22	224	4.70	714
8.....			3.53	210	3.07	188	4.65	693
9.....	3.21 ^g	221	3.33	160	3.02	177	4.65	693
10.....	4.18	511	3.41	185	3.17	212	4.75	736
11.....	4.43	603	3.23	148	2.87	143	4.65	693
12.....	3.63	333	3.13	126	2.87	143	3.90	414
13.....	2.98 ^g	168	3.21	150	2.90	150	3.85	399
14.....	2.73	113	3.18	148	2.87	143	4.05	465
15.....	2.68	104	3.28	172	2.92	154	4.05	465
16.....	2.58	88	3.23	160	3.02	177	3.85	399
17.....	3.18	214	3.21	156	3.02	177	3.55	310
18.....	3.03	179	3.21	160	3.05	184	3.50	296
19.....	2.88	146	3.13	152	3.15	207	3.50	296
20.....	3.31	246	3.08	144	3.12	200	3.50	296
21.....	3.58	318	3.13	154	3.07	188	4.99	844
22.....	3.38	264	2.93	116	3.07	188	3.50	296
23.....	3.03	179	2.88	104	3.09	193	3.50	296
24.....	2.93	157	2.93	128	3.42	274	3.00	172
25.....	3.03	179	2.98	138	3.56	313	2.95	161
26.....	2.88	146	3.08	160	3.77	375	2.95	161
27.....	3.08	190	3.21	190	3.77	375	4.75	736
28.....	2.98	168	3.28	208	4.01	451	5.68	1,159
29.....	2.88	146	3.13	188	4.32	552	4.65	693
30.....	2.78	124	3.01	162	4.81	762	3.97	438
31.....	2.88	146	.....	.....	5.22	949	.....	.....

^g Ice going out, Mar. 9 to Mar. 13.^s Shifting conditions April 6 to May 6.

DAILY GAUGE HEIGHT AND DISCHARGE of North Branch, Sheep river, near Millarville, for 1916
—Concluded

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	3.62	330	2.35	86	2.65	266	2.42	172
2.....	3.85	399	2.30	84	2.62	260	2.40	166
3.....	4.02	455	2.30	88	2.68	274	2.40	164
4.....	3.90	414	2.38	108	4.92	1,144	2.38	156
5.....	3.44	280	2.45	126	4.75	1,068	2.40	162
6.....	3.27	236	2.55	154	4.20	820	2.60	204
7.....	3.20	219	2.45	140	3.65	586	2.60	203
8.....	3.15	207	2.35	124	3.35	470	2.50	178
9.....	3.15	207	3.17	332	3.20	418	2.45	166
10.....	3.10	195	3.35	394	3.10	388	2.50	172
11.....	2.45	70	2.98	290	2.95	340	2.51	175
12.....	2.26	50	2.75	236	2.85	308	2.46	158
13.....	2.12	39	2.65	220	2.90	322	2.43	152
14.....	2.05	35	2.58	204	2.90	318	2.43	152
15.....	2.05	35	2.50	192	2.85	304	2.43	150
16.....	1.85	23	2.47	192	2.75	276	2.41	142
17.....	1.85	23	2.49	200	2.67	250	2.49	160
18.....	1.85	23	6.14	1,660	2.62	238	2.51	158
19.....	1.80	22	6.09	1,650	2.57	224	2.46	148
20.....	1.95	29	4.51	930	2.50	206	2.56	164
21.....	1.90	26	4.14	780	2.48	200	2.66	188
22.....	1.85	23	3.83	658	2.45	192	2.56	160
23.....	1.85	23	3.66	596	2.45	192	2.56	160
24.....	1.80	22	3.44	516	2.42	184	2.64	176
25.....	1.80	22	3.27	465	2.40	176	2.61	170
26.....	2.20	45	3.07	396	2.40	176	2.66	180
27.....	2.65	106s	3.00	376	2.35	164	2.63	176
28.....	2.55	96	2.90	340	2.35	162	2.46	136
29.....	2.48	92	2.87	332	2.35	162	2.46	136
30.....	2.45	92	2.70	284	2.35	160	2.36	118
31.....	2.40	86	2.65	270	.....	.....	2.41	128s

s Shifting conditions, July 27 to Oct. 31.

MONTHLY DISCHARGE of North Branch, Sheep river, near Millarville, for 1916

(Drainage area 199 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (9-31).....	603	88	215	1.080	0.92	9,808
April.....	333	104	180	0.905	1.01	10,711
May.....	949	143	276	1.390	1.60	16,971
June.....	1,419	161	630	3.170	3.54	37,488
July.....	455	22	127	0.638	0.74	7,809
August.....	1,660	84	401	2.020	2.33	24,657
September.....	1,144	169	342	1.720	1.92	20,350
October.....	204	118	162	0.814	0.94	9,961
The period.....	.....	.....	.....	.....	13.00	137,755

SESSIONAL PAPER No. 25a

MEAN MONTHLY DISCHARGE in Second-feet, of North Branch, Sheep river, near Millarville

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		9			61	20.0	56	87	162	66	4,048
November					31a			29e			
December											
January											
February											
March							44d	215f			
April	227		104	80b	71.0c	32	180		136	8,086	
May	418		156	165	120.0	504	276		273	16,793	
June	233		180	160	97.0	581	630		314	18,656	
July	219		441	151	35.0	466	127		240	14,751	
August	71		123	84	7.3	148	401		139	8,548	
September	11		43	30	8.0	90	342		87	5,195	
Total in acre-ft....	71,570	553		63,729	43,079	20,723	115,500	133,891			76,077

a 1-15.

b 15-30.

c 8-30.

d 15-31.

e 1-13.

f 9-31.

SOUTH BRANCH OF SHEEP RIVER AT BLACK DIAMOND

Location.—On steel highway bridge on road allowance between Secs. 8 and 17, Tp. 20, Rge. 2, W. 5th Mer., about one-half mile from Black Diamond post office.

Records available.—From May 23, 1908, to October 31, 1916.

Gauge.—Standard chain gauge; zero elevation maintained at 93.66 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Permanent.

Discharge measurements.—Made from traffic bridge or by wading.

Winter flow.—No observations taken during winter months.

Observer.—Frank Starley.

DISCHARGE MEASUREMENTS of South Branch, Sheep river, at Black Diamond, in 1916

Date	Engineer	Width	Area of of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 6	J. M. Paul	71	87.9	1.73	0.61	152
May 4	W. M. Edwards	88	151.0	2.61	1.30	396
June 21	R. J. McGuinness	116	478.0	5.99	3.57	2,862
July 26	W. M. Edwards	86	164.0	2.48	1.00	407
Aug. 25	do	91	207.0	4.47	1.51	927
Oct. 13	do	84	106.0	2.04	0.41	216
Oct. 24	W. H. Hannan	83	112.0	1.93	0.41	217

DAILY GAUGE HEIGHT AND DISCHARGE of South Branch, Sheep river, at Black Diamond, for 1916

DAY	April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			0.92	249	2.24	1,013
2.....				290 ^e	2.28	1,048
3.....			1.14	328	3.50	2,730
4.....			1.20	352	3.60	2,911
5.....			1.23	365	3.08	2,010
6.....	0.61	152	1.18	344	2.97	1,847
7.....		200 ^e	1.32	404	2.95	1,819
8.....	0.93	252	1.12	320	3.00	1,890
9.....	0.85	226	0.94	256	3.03	1,935
10.....	0.75	194	0.76	198	2.97	1,847
11.....	0.71	182	0.70	179	2.50	1,264
12.....	0.70	179	0.60	149	2.41	1,170
13.....	0.65	164	0.62	155	2.59	1,363
14.....	0.64	161	0.60	149	3.09	2,025
15.....	0.66	167	0.72	185	3.75	3,182
16.....	0.58	143	0.75	194	3.65	3,002
17.....	0.52	127	0.80	210	3.72	3,128
18.....	0.45	108	0.93	252	3.63	2,965
19.....	0.42	99	1.09	308	3.54	2,802
20.....	0.40	94	1.08	305	4.05	3,726
21.....	0.32	74	1.10	312	3.57	2,857
22.....	0.28	64	1.04	290	2.66	1,580
23.....	0.28	64	0.96	262	2.31	1,231
24.....	0.28	64	1.09	308	2.38	1,296
25.....	0.28	64	1.10	312	2.33	1,250
26.....	0.57	141	1.08	305	2.45	1,364
27.....	0.84	223	1.30	395	3.60	2,911
28.....	0.87	232	1.95	776	5.90	7,074
29.....	0.65	164	1.80	669	3.30	2,399
30.....	0.44	105	1.85	704	2.58	1,494
31.....			2.12	912		

^e Discharge estimated.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of South Branch, Sheep river,
at Black Diamond, for 1916.—*Concluded.*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	2.53	1,443	0.75	361	0.84	522	0.42	300
2.....	.....	1,766 ^e	0.72	358	0.85	528	0.40	290
3.....	3.08	2,088	0.75	376	0.93	570	0.37	274
4.....	2.50	1,412	0.66	348	1.75	1,103	0.40	280
5.....	2.16	1,102	0.75	389	1.32	805	0.40	270
6.....	2.03	999	0.70	375	1.20	725	0.45	280
7.....	2.00	976	0.61	349	1.05	640	0.40	259
8.....	2.11	1,060	.....	505 ^e	0.94	576	0.35	240
9.....	2.05	1,014	1.58	862	0.85	528	0.32	229
10.....	1.93	925	1.42	760	0.79	509	0.35	229
11.....	1.86	876	1.12	600	0.74	478	0.40	237
12.....	1.70	772	0.94	510	0.70	459	0.40	225 ^s
13.....	1.70	772	0.88	490	0.72	469	0.41	218
14.....	1.55	681	0.85	480	0.68	450	0.40	215
15.....	1.46	630	0.78	455	0.63	426	0.40	215
16.....	1.41	603	0.75	444	0.60	411	0.40	215
17.....	1.40	598	0.70	430	0.57	400	0.38	211
18.....	1.46	630	5.50	6,870	0.55	390	0.39	213
19.....	1.30	546	2.85	2,310	0.50	368	0.40	215
20.....	1.24	517	1.94	1,240	0.48	359	0.43	222
21.....	1.15	474	1.74	1,080	0.46	349	0.43	222
22.....	1.08	441	1.70	1,055	0.45	342	0.42	220
23.....	0.99	400	1.80	1,140	0.43	337	0.42	220
24.....	0.95	385	1.72	1,080	0.37	308	0.41	218
25.....	0.97	393	1.51	927 ^d	0.37	309	0.39	213
26.....	1.00	404	1.25	755	0.39	310	0.45	228
27.....	0.97	401 ^s	1.12	680	0.40	310	0.43	222
28.....	0.90	385	1.05	640	0.35	290	0.38	211
29.....	0.85	375	0.99	604	0.32	279	0.35	204
30.....	0.81	370	0.95	582	0.36	286	0.35	204
31.....	0.78	365	0.90	556	.....	.....	0.34	202

^s Shifting conditions July 27-October 12.^e Discharge estimated.^d Actual measurement.

MONTHLY DISCHARGE of South Branch, Sheep river, at Black Diamond, for 1916

(Drainage area 248 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April (6-30).....	252	64	146	0.589	0.55	7,238
May.....	912	149	337	1.360	1.57	20,721
June.....	7,074	1,013	2,238	9.020	10.06	133,170
July.....	2,088	365	768	3.100	3.57	47,222
August.....	6,870	348	891	3.590	4.14	54,785
September.....	1,103	279	461	1.860	2.08	27,431
October.....	300	202	232	0.935	1.08	14,265
The period.....	.....	.....	.....	.....	23.05	304,832

MEAN MONTHLY DISCHARGE in Second-feet of South Branch, Sheep river, at Black Diamond

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		78	136	162	128	111	* 157	187	232	149	9,151
Nov.					93c						
Dec.											
January											
Feb.											
March			116d				75e				
April			98	236	152f	108	99	146f		354	8,048
May			286	279	250	310	952	337		402	24,739
June		278	606	501	532	414	1,524	2,238		870	51,797
July	567a	139	250	788	346	206	1,017	768		502	30,867
August	228	127	544	250	310	104	390	891		356	21,857
Sept.	116	228	450	134	164	107	228	461		236	14,043
Total in Acre-feet	42,277	51,261	144,525	142,841	112,892	82,375	266,480	302,065			160,502

a 13-31.

b 27-31.

c 1-15.

d 14-30.

e 21-31.

f 6-30.

SHEEP RIVER NEAR OKOTOKS

Location.—On the NW. $\frac{1}{4}$ Sec. 22, Tp. 29, Rge. 29, W. 4th Mer., at the Canadian Pacific Railway Company's bridge about one mile southeast of Okotoks.

Records available.—From May 7, 1909, to December 31, 1916.

Gauge.—Chain gauge; zero elevation maintained at 3,419.12 during 1915 and 1916. High water staff gauge is imbedded in the cement on centre pier; elevation of the zero maintained at 3,419.57 feet during 1912-16.

Bench-mark.—Top of the left abutment of southwest corner; elevation 3,431.57 feet above mean sea-level (C.P.R. datum).

Channel.—Gravel, very shifting.

Discharge measurements.—From bridge or by wading.

Winter flow.—Records taken in 1916

Observer.—Miss M. B. Henderson.

DISCHARGE MEASUREMENTS of Sheep river near Okotoks, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 5	J. M. Paul	124	259	1.71	3.46	444
May 6	W. M. Edwards	147	295	2.37	3.73	700
May 31	do	281	881	4.27	5.60	3,754
June 19	R. J. McGuinness	268	925	3.80	5.50	3,498
June 24	do	198	660	3.55	4.61	2,343
June 26	do	198	626	3.45	4.60	2,159
July 5	do	231	642	4.05	5.03	2,599
July 28	W. M. Edwards	148	253	1.97	3.36	497
Aug. 24	do	254	685	2.58	3.79	1,766
Oct. 23	W. H. Hannan	95	250	1.41	1.60	354
Dec. 1	W. M. Edwards	80	59	2.11	3.53	125
Dec. 18	do	94	90	1.22	3.57b	110

b Ice conditions.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Sheep river near Okotoks, for 1916

DAY	March		April		May		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1			3.76	728	3.56	535		3,402 ^e	4.85	2,425
2			3.81	781	3.60	570	5.30	3,105	5.85	4,320
3			3.66	627	3.71	676	5.60	3,700	5.75	4,090
4			3.66	627		656 ^e	5.75	4,000	5.50	3,555
5			3.38	386		637 ^e	5.80	4,100	5.03	2,598 ^s
6			3.56	535	3.65	618		3,900 ^e	4.75	2,125
7				535 ^e	3.85	825	5.60	3,700	4.60	1,900
8			3.56	535	3.55	526	5.55	3,600	4.40	1,615
9		<i>g</i>	3.56	535	3.45	441		3,800 ^e		1,489 ^e
10			3.51	491	3.30	328	5.75	4,000	4.08	1,198
11			3.46	449	3.30	328		3,270 ^e	3.83	905
12		<i>g</i>	3.46	449	3.25	296	5.00	2,540	3.76	835
13			3.46	449	3.27	309	5.00	2,540	3.68	755
14			3.46	449	3.25	296	5.10	2,720	3.53	620
15			3.41	408	3.32	342	5.40	3,300	3.48	580
16			3.41	408		392 ^e	5.45	3,400	3.40	518
17			3.41	408	3.45	441		3,432 ^e	3.38	502
18	3.59	561	3.31	335		441 ^e		3,455 ^e	3.35	485
19	3.19	259	3.26	303	3.45	441	5.50	3,500 ^s	3.28	438
20		260 ^e	3.23	284	3.60	570	5.80	4,240	3.08	323
21		261 ^e	3.21	271	3.65	618	4.61	2,065	3.08	323
22		263 ^e	3.06	188	3.70	665	4.90	2,680	2.98	271
23		264 ^e	3.04	178	3.65	618	4.75	2,510	2.93	250
24		266 ^e	3.01	163	4.00	995	4.55	2,240	2.88	225
25		268 ^e	3.06	188	4.00	995	3.60	810	3.08	323
26		270 ^e	3.21	271	4.10	1,120	4.60	2,159	3.03	300
27	3.21	271	3.46	449	4.20	1,250	6.30	5,440	3.08	323
28	3.11	214	3.46	449		2,875 ^e	7.55	7,900	3.36	497
29	3.11	214	3.46	449	6.00	4,500	5.75	4,200	3.15	362
30	3.11	214	3.41	408	5.90	4,300	5.20	3,120	3.10	336
31	3.11	214			5.60	3,700			3.10	336

g Ice going out, Mar. 9 to Mar. 12.^e Discharge estimated.^s Shifting conditions, June 19 to July 5.

DAILY GAUGE HEIGHT AND DISCHARGE of Sheep river near Okotoks, for 1916—*Concluded*

DAY	August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	3.10	336	2.05	508	1.55	345	.....	345 ^e	3.53 ^x	125
2.....	.....	336 ^e	.....	1,474 ^e	.....	348 ^e	1.55	345	3.50	124
3.....	3.10	336	.....	2,440 ^e	.....	351 ^e	1.55	345	.....	123 ^e
4.....	3.07	319	4.85	3,405	1.53	354	.....	338 ^e	3.75	123
5.....	3.25	420	4.55	2,865	1.60	360	1.50	330	3.83	122
6.....	.....	364 ^e	4.10	2,160	1.60	360	.....	330 ^e	4.00	121
7.....	3.05	508	3.80	1,778	1.60	360	1.50	330	4.55	121
8.....	3.15	362	3.00	1,015	1.60	360	1.50	330	4.75	120
9.....	4.35	1,550	2.70	814	.....	360 ^e	.....	330 ^e	4.87 ^b	120
10.....	4.00	1,100	2.50	703	1.60	360	1.50	330	5.00	120
11.....	3.75	824	2.40	655	1.55	345	.....	330 ^e	5.00	119
12.....	3.35	486	2.25	589	.....	345 ^e	1.50	330	4.83	118
13.....	.....	411 ^e	2.00	490	1.55	345	.....	330 ^e	.....	117 ^e
14.....	3.10	336	.....	490 ^e	1.55	345	1.50	330	4.45	116
15.....	3.00	283	2.00	490	.....	345 ^e	1.50	330	3.90	115
16.....	.....	269 ^e	1.95	472	1.55	345	.....	334 ^e	3.75	113
17.....	2.95	255 ^s	1.80	420	1.55	345	1.53	339	3.70	112
18.....	7.80	9,345	.....	412 ^e	1.57	351	1.53	339	3.57	110
19.....	7.10	8,065	1.75	405	1.63	369	1.55	345	3.65	108
20.....	4.35	2,535	1.60	360	1.65	375	1.55	345	3.60	106
21.....	4.15	2,232	1.60	360	1.70	390	1.55	345	3.55	104
22.....	4.05	2,093	1.60	360	.....	375 ^e	1.53	339	.....	102 ^e
23.....	4.00	2,026	1.57	351	1.60	360	.....	334 ^e	3.55	100
24.....	3.79	1,766	1.55	345	1.60	360	1.50	330	3.55	98
25.....	3.90	1,899	1.55	345	.....	360 ^e	1.50	330	.....	96 ^e
26.....	.....	1,810 ^e	1.55	345	1.60	360	.....	330 ^e	.....	94 ^e
27.....	3.75	1,720	.....	345 ^e	1.55	345	1.50	330	3.40	92
28.....	3.05	1,054	1.55	345	1.55	345	1.50	330	3.40	90
29.....	2.35	632	.....	345 ^e	.....	345 ^e	1.50	330	3.60	87
30.....	2.25	589	1.55	345	1.55	345	1.50	330	.....	85 ^e
31.....	2.15	548	.....	.....	1.55	345	.....	.....	.....^b	83 ^e

b Ice conditions, Dec. 9 to Dec. 31.
e Discharge estimated.
x Gauge moved over main channel Dec. 1.
s Shifting conditions Aug. 17 to Aug. 20.

MONTHLY DISCHARGE of Sheep river near Okotoks, for 1916

(Drainage area 632 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Persquare Mile	Depth in Inches on Drainage Area	Total in Acre-feet
March (18-31).....	561	214	271	0.429	0.22	7,518
April.....	781	163	424	0.671	0.75	25,230
May.....	4,500	296	1,010	1.600	1.84	62,102
June.....	7,900	810	3,428	5.420	6.05	203,932
July.....	4,329	225	1,123	1.780	2.05	69,034
August.....	9,345	255	1,439	2.280	2.63	88,459
September.....	3,405	345	838	1.330	1.48	49,864
October.....	390	345	355	0.562	0.65	21,828
November.....	345	330	334	0.529	0.59	19,874
December.....	125	83	109	0.172	0.20	6,702
The period.....					16.46	554,543

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet, of Sheep river near Okotoks

MONTH	1907-8	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
Oct.		192	88	156	281	263	148	212	382	355	231	14,186
Nov.					230	d175				334	282	11,078
Dec.										109	109	6,702
January												
Feb.												
Mar.									f156	g271		
April.	a174		112	273	c305	345	e228	124	424		256	15,210
May.	969	b2,071	251	563	510	466	517	1,330	1,010		702	43,164
June.	2,397	2,018	251	855	915	735	563	2,871	3,428		1,559	92,773
July.	444	1,034	119	386	1,682	463	330	3,920	1,123		1,056	64,911
August.	187	318	115	853	387	411	128	847	1,439		521	32,008
Sept.	123	130	210	688	221	194	108	466	838		331	19,686
Total in acre-feet.	257,267	325,474	69,314	228,423	251,780	179,579	121,164	598,505	529,627			299,718

a 5-30.

b 7-31.

c 6-15.

d 1-15.

e 4-30.

f 17-31.

g 18-31.

HIGHWOOD RIVER AT BROWN'S RANCH

Location.—On SE. $\frac{1}{4}$ Sec. 20, Tp. 18, Rge. 2, W. 5th Mer., at B. F. Brown's ranch, about eight miles north of Pekisko and five miles west of Longview post office.

Records available.—July 27, 1912, to December 31, 1916.

Gauge.—Vertical staff. Elevation of zero maintained at 93.90 feet during 1912. Elevation of zero maintained at 91.97 feet during 1913-1916.

Bench-mark.—Permanent iron bench-mark, assumed elevation 100.00 feet.

Channel.—Shifts during floods.

Discharge measurements.—Made from the traffic bridge one and one-half miles down stream or by wading near bridge.

Winter flow.—Not taken until 1916.

Observer.—B. F. Brown.

DISCHARGE MEASUREMENTS of Highwood river at Brown's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 3	J. M. Paul	55	71.6	2.95	0.80	211
May 4	W. M. Edwards	192	305.0	3.42	1.87	1,045
May 27	do	184	261.0	3.40	1.75	887
July 8	R. J. McGuinness	193	521.0	5.61	3.65	2,931
July 25	W. M. Edwards	154	287.0	3.20	1.40	919
Aug. 22	do	156	358.0	3.49	1.75	1,249
Sept. 20	do	123	224.0	1.89	0.80	424
Oct. 27	do	121	222.0	1.69	0.65	374
Nov. 30	do	119	121.0	1.58	0.65b	191
Dec. 16	do	114	176.0	0.82	0.85b	146

b Ice conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Highwood river at Brown's ranch, for 1916

DAY	March		April		May		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1			0.75	192	1.47	641	2.25	1,552	3.59	3,300
2			0.75	192	1.52	686	2.30	1,675	4.22	4,200
3			0.80	211	1.55	714	3.55	3,579	4.16	4,050
4			0.81	216	1.87	1,045	3.50	3,500	4.23	4,100
5			1.00	311	2.05	1,272	3.60	3,658	2.96	2,060
6			1.03	328	2.08	1,313	3.25	3,105	1.94	780
7			1.00	311	2.25	1,552	3.05	2,789	3.65	3,000
8			1.02	323	1.95	1,142	3.10	2,868	3.65	2,930
9			0.97	295	1.80	963	3.30	3,184	3.77	3,200
10			1.03	328	1.65	808	3.40	3,342	3.62	3,050
11			1.02	323	1.58	741	3.05	2,789	3.47	2,910
12			1.01	317	1.53	695	2.90	2,552	3.27	2,700
13			0.97	295	1.55	714	2.85	2,473	3.16	2,600
14			0.97	295	1.45	624	3.15	2,947	3.03	2,490
15			1.12	382	1.40	580	3.90	4,132	2.81	2,240
16			1.02	323	1.38	564	4.45	5,001	2.71	2,160
17			1.12	382	1.40	580	4.70	5,396	2.73	2,260
18			1.05	340	1.43	606	4.95	5,791	2.62	2,180
19			1.02	323	1.45	624	4.25	4,685	2.63	2,260
20			1.02	323	1.55	714	4.10	4,448	2.43	2,020
21			1.00	311	1.68	837	3.70	3,816	2.28	1,860
22			0.97	295	1.75	910	3.40	3,342	2.26	1,880
23			0.92	269	1.70	856	3.20	3,026	2.08	1,680
24			0.97	295	1.70	856	3.15	2,947	2.03	1,630
25			0.92	269	1.65	808	3.45	3,421	1.40	895 ^a
26	1.30	500	1.12	382	1.60	760	3.30	3,184	1.45	942
27	1.30	500	1.42	597	1.75	910	4.25	4,600 ^a	1.40	895
28	1.25	466	1.52	686	1.85	1,022	6.50	8,040	1.34	838
29	1.20	432	1.42	597	2.15	1,410	4.72	5,190	1.25	758
30	1.15	400	1.32	516	2.15	1,410	3.77	3,650	1.20	715
31	0.95	284			2.20	1,480			1.15	675

^a Shifting conditions. June 27 to July 25.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Highwood river at Brown's ranch, for 1916—*Concluded*

DAY	August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	1.10	635	1.05	600	0.65	368	0.54	318	0.50	188
2.....	1.07	614	1.07	614	0.70	390	0.53	314	0.55	185
3.....	1.03	586	1.00	565	0.68	381	0.54	318	0.60	182
4.....	1.02	579	1.85	1,388	0.65	368	0.55	322	0.67	179
5.....	0.98	552	1.66	1,161	0.67	376	0.55	322	0.65	176
6.....	0.95	532	1.85	1,388	0.75	415	0.50	300	0.55	174
7.....	0.93	520	1.43	924	0.70	390	0.45	285	0.22	170
8.....	0.93	520	1.32	819	0.68	381	0.41	273	0.65	167
9.....	1.34	838	1.20	715	0.65	368	0.47	291	0.50	164
10.....	1.44	933	1.05	600	0.65	368	0.40	270	0.60	161
11.....	1.20	715	1.05	600	0.70	390	0.35	255	0.65	157
12.....	1.05	600	0.98	552	0.69	386	0.35b	258	0.70	155
13.....	1.00	565	1.01	572	0.65	368	1.01	262	0.75	152
14.....	0.95	532	0.95	532	0.65	368	0.85	264	0.80	150
15.....	0.90	500	0.93	520	0.65	368	1.04	265	0.93	148
16.....	0.88	488	0.91	506	0.68	381	1.02	264	0.85	146
17.....	0.85	470	0.87	482	0.72	400	0.96	261	0.75	143
18.....	3.45	3,778	0.82	452	0.70	390	0.93	255	0.73	140
19.....	2.39	2,136	0.79	435	0.67	376	0.85	250	0.70	137
20.....	2.00	1,585	0.80	440	0.75	415	0.60	242	0.70	134
21.....	1.85	1,388	0.75	415	0.72	400	0.67	235	0.67	131
22.....	1.75	1,265	0.73	405	0.70	390	0.73	228	0.65	128
23.....	1.88	1,425	0.70	390	0.65	368	0.65	223	0.60	124
24.....	1.80	1,325	0.70	390	0.67	376	0.64	218	0.90	121
25.....	1.75	1,265	0.67	376	0.65	368	0.62	212	1.10	118
26.....	1.58	1,074	0.65	368	0.66	372	0.64	207	1.09	115
27.....	1.46	952	0.61	350	0.65	368	0.53	203	1.05	113
28.....	1.35	848	0.70	390	0.63	358	0.56	198	1.00	112
29.....	1.25	758	0.65	368	0.60	345	0.55	194	1.03	110
30.....	1.15	675	0.68	381	0.55	322	0.65	191	1.07	109
31.....	1.10	635	.....	.....	0.55	322	.....	.....	1.05b	109

b Ice conditions, Nov. 12 to Dec. 31.

MONTHLY DISCHARGE of Highwood river at Brown's ranch, for 1916

(Drainage area 421 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (26-31).....	500	284	430	1.020	0.22	5,116
April.....	686	192	341	0.810	0.90	20,291
May.....	1,552	564	898	2.130	2.46	55,216
June.....	8,040	1,552	3,689	8.760	9.77	219,458
July.....	4,200	675	2,170	5.150	5.94	133,430
August.....	3,778	470	945	2.240	2.58	58,106
September.....	1,388	350	590	1.400	1.56	35,107
October.....	415	322	375	0.801	1.03	23,058
November.....	3,221	191	257	0.610	0.68	15,293
December.....	188	109	145	0.344	0.40	8,916
The period.....	.....	.....	.....	.....	25.54	573,991

PEKISKO CREEK AT PEKISKO

Location.—On the NW. $\frac{1}{4}$ Sec. 8, Tp. 17, Rge. 2, W. 5th Mer., at George Lane's Bar U ranch, and about twenty-five miles southwest of High River.

Records available.—October 6, 1911, to October 31, 1916.

Gauge.—Vertical staff; elevation of zero of gauge is 93.90 feet which has been unchanged since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Fairly permanent.

Discharge measurements.—Made from a small suspension foot-bridge or by wading.

Winter flow.—Observations not taken during winter months.

Diversions.—The headgates of George Lane's irrigation ditch are about one and one-half miles up stream from station.

Observer.—T. A. Thronsen.

DISCHARGE MEASUREMENTS of Pekisko creek at Pekisko, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 3.	J. M. Paul.	53	45.8	1.01	1.39	46
May 3.	W. M. Edward.	49	54.6	1.63	1.74	89
May 26.	do	53	55.9	1.74	1.73	97
July 6.	R. J. McGuinness.	57	107.0	1.89	2.18	203
July 24.	W. M. Edwards.	52	45.8	1.24	1.49	57
Aug. 23.	do	55	66.3	2.07	1.88	137
Sept. 21.	do	33	26.4	1.98	1.47	52
Oct. 26.	do	53	49.4	1.46	1.63	72

DAILY GAUGE HEIGHT AND DISCHARGE of Pekisko creek at Pekisko, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.			1.64	77	1.72	90	2.51	322
2.			1.50	58	1.70	87	2.60	354
3.			1.39	45	1.74	94	2.95	476
4.			1.42	48	1.84	113	3.26	585
5.			1.38	44	1.84	113	3.40	634
6.			1.47	54	1.84	113	2.90	459
7.			1.46	53	1.82	109	2.78	417
8.			1.52	61	1.74	94	2.72	396
9.			1.46	53	1.72	90	2.74	403
10.	2.49	316	1.54	63	1.66	81	2.76	410
11.	2.54	333	1.60	71	1.63	76	2.52	326
12.	2.16	202	1.53	62	1.66	81	2.44	298
13.	2.00	153	1.48	56	1.67	82	2.44	298
14.	1.82	109	1.47	54	1.66	81	2.44	298
15.	1.65	79	1.56	66	1.64	77	2.58	347
16.	1.56	66	1.54	63	1.65	79	2.58	347
17.	1.52	61	1.54	63	1.68	84	2.48	312
18.	1.48	56	1.54	63	1.69	85	2.42	291
19.	1.44	51	1.52	61	1.70	87	2.40	284
20.	1.57	67	1.48	56	1.70	87	2.49	316
21.	1.53	62	1.48	56	1.71	89	2.43	294
22.	1.54	63	1.48	56	1.71	89	2.25	232
23.	1.46	53	1.43	50	1.72	90	2.13	192
24.	1.31	37	1.42	48	1.79	102	2.06	170
25.	1.51	59	1.40	46	1.83	111	2.07	173
26.	1.36	42	1.56	66	1.73	92	2.11	185
27.	1.34	40	1.62	74	1.90	127	2.31	252
28.	1.38	44	1.67	82	2.25	232	3.35	266
29.	1.38	44	1.64	77	2.43	294	2.76	410
30.	1.44	51	1.64	77	2.55	336	2.55	336
31.	1.40	46			2.63	364		

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Pekisko creek at Pekisko, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	2 33	260	1 34	40	1 46	53	1 48	56
2	2 87	448	1 32	38	1 49	57	1 49	57
3	2 85	442	1 32	38	1 58	68	1 50	58
4	2 49	316	1 31	37	2 38	277	1 46	53
5	2 31	252	1 31	37	2 10	182	1 51	59
6	2 21	218	1 31	37	1 90	127	1 64	77
7	2 16	202	1 29	35	1 86	118	1 60	71
8	2 10	182	1 28	34	1 74	94	1 54	63
9	2 02	159	1 57	67	1 72	90	1 54	63
10	1 94	137	1 61	73	1 68	84	1 56	66
11	1 86	118	1 52	61	1 63	76	1 58	68
12	1 82	109	1 40	46	1 58	68	1 58	68
13	1 80	104	1 34	40	1 64	77	1 60	71
14	1 74	94	1 30	36	1 60	71	1 62	74
15	1 71	89	1 26	32	1 57	67	1 62	74
16	1 68	84	1 23	29	1 54	63	1 63	76
17	1 66	81	1 21	27	1 52	61	1 64	77
18	1 70	87	2 95	476	1 50	58	1 64	77
19	1 64	77	2 40	284	1 47	54	1 65	79
20	1 60	77	2 12	189	1 44	51	1 66	81
21	1 54	63	2 01	156	1 42	48	1 66	81
22	1 51	59	1 95	140	1 43	50	1 64	77
23	1 51	59	1 88	122	1 46	53	1 64	77
24	1 48	56	1 81	106	1 43	50	1 62	74
25	1 46	53	1 72	90	1 44	51	1 58	68
26	1 62	74	1 70	87	1 42	48	1 62	74
27	1 56	66	1 64	77	1 42	48	1 60	71
28	1 44	51	1 58	68	1 41	47	1 56	66
29	1 40	46	1 54	63	1 39	45	1 56	66
30	1 38	44	1 50	58	1 42	48	1 58	68
31	1 36	42	1 46	53			1 54	63

MONTHLY DISCHARGE of Pekisko creek at Pekisko, for 1916

(Drainage area 99 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (10-31)	333	37	92	0 929	0 76	4,014
April	82	44	60	0 606	0 68	3,570
May	364	76	120	1 210	1 40	7,378
June	634	170	336	3 390	3 78	19,993
July	448	42	134	1 350	1 56	8,239
August	476	27	85	0 868	1 00	5,288
September	277	45	76	0 767	0 86	4,522
October	81	53	69	0 697	0 80	4,243
The period					10 84	57,247

STIMSON CREEK NEAR PEKISKO

Location.—On the SE. $\frac{1}{4}$ Sec. 14, Tp. 17, Rge. 2, W. 5th Mer., near E. R. Baker's ranch and about five miles from Pekisko post office; at the traffic bridge on the surveyed trail running southwest from High River.

Records available.—From October 6, 1911, to October 31, 1916.

Gauge.—Vertical staff; zero elevation maintained at 92.54 from date of establishment to June 30, 1912, and at 90.20 during 1916. From June 30, 1912, to October 31, 1915, the gauge was located on NW. $\frac{1}{4}$ Sec. 2, Tp. 17, Rge. 2, W. 5th Mer.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Coarse gravel, fairly permanent.

Discharge measurements.—From bridge or by wading.

Winter flow.—No observation taken during winter months.

Observer.—W. Garrett.

DISCHARGE MEASUREMENTS of Stimson creek near Pekisko, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 4.	J. M. Paul.	44	46.8	1.59	4.27	74
May 3.	W. M. Edwards.	46	44.5	1.11	3.88	49
May 26.	do.	54	90.0	1.78	4.13	160
July 6.	R. J. McGuinness.	73	87.5	1.90	4.10	166
July 24.	W. M. Edwards.	41	36.1	1.02	3.65	37
Aug. 23.	do.	30	27.2	1.73	3.71	47
Sept. 21.	do.	43	39.2	0.66	3.60	26
Oct. 26.	do.	49	56.2	1.11	3.80	63

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Stimson creek near Pekisko, for 1916

DAY	April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1			3.86	41	5.10	810
2			3.88	47	4.70	505
3			3.88	49 <i>d</i>	4.70	505
4	4.27	74 <i>ds</i>	3.83	42	4.70	505
5	4.10	41	3.81	40	4.80	573
6	4.10	43	3.79	39	4.80	573
7	4.10	45	3.74	33	4.60	439
8	4.50	160	3.74	34	4.45	344
9	4.50	165	3.72	33	4.40	313
10	4.50	169	3.69	30	4.40	313
11	4.00	35	3.71	34	4.35	284
12	3.95	28	3.76	42	4.30	256
13	3.95	29	3.83	58	4.20	202
14	3.95	30	3.84	60	4.25	229
15	3.95	32	3.86	66	4.10	158
16	3.90	26	3.83	60	4.10	158
17	3.90	28	3.80	56	4.10	158
18	3.90	29	3.78	52	4.10	158
19	3.88	27	3.80	58	4.00	120
20	3.80	17	3.80	59	4.10	158
21	3.80	19	3.73	45	4.20	202
22	3.80	20	3.70	40	4.00	120
23	3.80	21	3.75	49	4.10	158
24	3.78	20	3.93	90	4.00	120
25	3.75	17	4.13	160	4.00	120
26	3.73	16	4.15	160 <i>d</i>	4.00	120
27	3.73	17	4.22	212	4.30	256
28	3.73	18	4.22	212	5.30	983
29	3.77	25	4.40	313	4.85	612
30	3.78	27	4.19	198	4.42	325
31			5.10	810		

d Actual measurement.

* Shifting conditions, April 4 to May 27.

DAILY GAUGE HEIGHT AND DISCHARGE of Stimson creek near Pekisko, for 1916—*Concluded*.

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	4.15	180	3.60	28.0	3.50	14.5	3.66	38
2.....	5.30	983	3.50	14.5	3.48	12.1	3.70	45
3.....	5.00	729	3.50	14.5	3.47	10.9	3.70	45
4.....	4.50	375	3.50	14.5	4.80	573.0	3.70	45
5.....	4.50	375	3.50	14.5	4.85	612.0	3.72	49
6.....	4.20	202	3.55	22.0	3.88	85.0	3.72	49
7.....	4.10	158	3.55	22.0	3.88	85.0	3.86	80
8.....	4.00	120	3.55	22.0	3.86	80.0	3.83	72
9.....	4.00	120	4.17	189.0	3.86	80.0	3.79	63
10.....	4.00	120	3.85	78.0	3.83	72.0	3.79	63
11.....	3.90	90	3.80	65.0	3.82	70.0	3.80	65
12.....	3.90	90	3.75	55.0	3.82	70.0	3.70	45
13.....	3.80	65	3.60	28.0	3.82	70.0	3.70	45
14.....	3.80	65	3.60	28.0	3.80	65.0	3.70	45
15.....	3.80	65	3.50	14.5	3.80	65.0	3.70	45
16.....	3.80	65	3.50	14.5	3.79	63.0	3.70	45
17.....	3.80	65	3.50	14.5	3.78	61.0	3.70	45
18.....	3.80	65	5.10	810.0	3.74	53.0	3.75	55
19.....	3.80	65	4.50	375.0	3.71	47.0	3.75	55
20.....	3.80	65	4.50	375.0	3.67	40.0	3.75	55
21.....	3.80	65	4.20	202.0	3.62	32.0	3.77	59
22.....	3.80	65	4.00	120.0	3.60	28.0	3.77	59
23.....	3.70	45	3.70	45.0	3.60	28.0	3.78	61
24.....	3.70	45	3.55	22.0	3.60	28.0	3.78	61
25.....	3.65	37	3.55	22.0	3.59	27.0	3.70	63
26.....	3.65	37	3.75	55.0	3.59	27.0	3.79	63
27.....	3.60	28	3.70	45.0	3.60	28.0	3.79	63
28.....	3.60	28	3.55	22.0	3.60	28.0	3.79	63
29.....	3.60	28	3.52	17.3	3.62	32.0	3.77	59
30.....	3.60	28	3.50	14.5	3.62	32.0	3.75	55
31.....	3.60	28	3.50	14.5	.....	.....	3.69	43

MONTHLY DISCHARGE of Stimson creek near Pekisko, for 1916

(Drainage area 78 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April (4-30).....	169	16.0	44	0.564	0.57	2,357
May.....	810	30.0	104	1.330	1.53	6,395
June.....	983	120.0	326	4.180	4.66	19,398
July.....	983	28.0	145	1.860	2.14	8,916
August.....	810	14.5	90	1.150	1.33	5,534
September.....	612	10.9	84	1.080	1.20	4,998
October.....	80	38.0	55	0.705	0.81	3,382
The period.....	.....	.....	.....	.....	12.24	50,980

SESSIONAL PAPER No. 25B

FINDLAY AND MCDUGALL DITCH FROM HIGHWOOD RIVER

Location.—On SW. $\frac{1}{4}$ Sec. 31, Tp. 18, Rge. 29, W. 4th Mer., about four and one-half miles west of the town of High River.

Records available.—June 17, 1911, to October, 1916. Discharge measurements only during 1914-15.

Gauge.—Vertical staff; zero elevation maintained at 99.25 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Soft mud liable to shift.

Discharge measurements.—By wading.

Winter flow.—Ditch closed at freeze-up.

Artificial control.—Discharge at station may be controlled by means of the headgates about one-quarter mile above station.

Observer.—J. C. Pike.

DISCHARGE MEASUREMENTS of Findlay and McDougall ditch from Highwood river, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 1	J. M. Paul					Nil
May 4	W. M. Edwards	5.0	2.20	0.48	1.04	1.06
May 27	do				0.96	.....x
July 25	do	5.0	2.70	0.11	1.16 ^h	0.29
Aug. 22	do				0.92	.....x

x No flow, water in pools.

h Headgate closed, discharge surface flow only.

DAILY GAUGE HEIGHT IN FEET of Findlay and McDougall ditch from Highwood River, for 1916

DAY	May	June	July	August
1				
2				
3	1.80 ^h	1.50		2.00
4	1.01 ^h	1.50		1.80
5				0.92
6				1.25
7				1.00
8				0.80
9				0.72
10				0.70
11			1.90	0.60
12			1.55	0.52
13			1.40	0.50
14			1.35	
15	1.45 ^h		1.25	
16	1.50		1.12	
17	1.35		1.10	
18	1.50		1.10	
19	1.55			
20	1.50			
21	1.65			
22	1.70			0.92
23	1.80			
24	2.00			
25	1.65		1.16	
26	1.50			1.00
27	0.96			
28	1.17			
29	1.50			
30	1.65			
31	1.45			

^h Ditch opened May 3-4 for stock, closed May, 5-15; opened for irrigation May 15, closed May 27; leakage May 28 to June 5; headgate closed completely June 6 to July 10; closed July 19 to August 2. Final closing of headgate not recorded.

LITTLE BOW DITCH FROM HIGHWOOD RIVER

Location.—On the SW. $\frac{1}{4}$ Sec. 6, Tp. 19, Rge. 28, W. 4th Mer., about 100 feet from the power station and pumping plant of the town of High River.

Records available.—August 1, 1910, to December 31, 1915.

Gauge.—Vertical staff. Zero elevation maintained at 91.06 feet during 1910-11. Zero elevation maintained at 92.06 feet from 1912, to September 9, 1915, and at 91.68 since that date.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Fairly permanent.

Discharge measurements.—Made by wading with current-meter.

Winter flow.—Continuous records kept during winter.

Artificial control.—Formed by headgates of ditch about twenty feet below station.

Observer.—Philip Weinard.

Remarks.—Ditch works damaged by flood, ditch not used after July 15, 1916.

DISCHARGE MEASUREMENTS of Little Bow ditch from Highwood River, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 6.	F. K. Beach.					Nil
Feb. 4.	R. N. Hayden.	13.0	18.20	0.06	3.15	1.02
Mar. 7.	S. H. Frame.	17.2	24.20	0.54	1.67	13.10
April 1.	J. M. Paul.	17.5	13.90	0.86	0.83	12.00
May 3.	W. M. Edwards.	17.0	24.20	1.09	1.37	27.00
May 26.	do.	17.0	26.40	1.29	1.47	34.00
July 8.	R. J. McGuinness.	4.0	2.50	2.79	0.84	7.00
July 24.	W. M. Edwards.					Nil
Aug. 23.	do.					Nil
Nov. 30.	do.					Nil
Dec. 16.	do.					Nil

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Little Bow ditch from Highwood River, for 1916

DAY	January		February		March		April	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	0.00b	Nil	3.20	1.44	1.70	6.0	0.75	8.7
2	0.00	"	3.20	1.44	1.60	5.0	1.19	22.0
3	0.00	"	3.00	1.10	1.62	6.4	1.00	15.5
4	0.00	"	3.15	1.02d	1.70	9.4	1.00	15.5
5	0.00	"	3.00	1.00	1.68	10.1	0.90	12.5
6	0.00	"	3.10	2.20	1.67b	13.1d	0.88	11.9
7	0.00	"	3.05	2.10	1.67	13.0e	0.85	11.1
8	0.00	"	3.05	3.50	1.55	15.0	0.84	10.8
9	0.35	2.00e	3.05	4.50	1.55	15.0	0.90	12.5
10	0.00	Nil	3.04	5.60	2.25	10.0	0.90	12.5
11	0.00	"	3.00	6.20	2.35	10.0	0.80	9.8
12	0.00	"	3.00	7.50	2.75	10.0	0.85	11.1
13	0.00	"	3.00	9.60	1.85	11.0	0.82	9.3
14	0.00	"	3.02	12.00	1.65	12.0	0.70	7.6
15	0.60	1.60e	3.02	14.00	1.35	15.0	0.80	9.8
16	2.50	1.70	3.60	37.00	1.30	17.0	0.80	9.8
17	2.45	1.60	3.60	40.00	1.30	17.0	0.76	8.9
18	2.85	1.40	3.23	29.00	1.30	17.0	0.65	6.8
19	2.90	1.40	3.15	28.00	1.30	18.0	0.65	6.8
20	2.90	1.40	3.15	30.00	1.70	19.0	0.60	6.0
21	2.93	1.40	3.05	29.00	1.75	20.0	0.60	6.0
22	3.00	1.50	3.03	30.00	1.75	21.0e	0.68	7.3
23	2.70	1.35	2.98	30.00	1.00	15.5	0.65	6.8
24	2.88	1.40	2.75	24.00	0.95	14.0	0.63	6.5
25	2.38	1.20	2.47	17.00	0.70	7.6	0.60	6.0
26	2.52	1.00	1.94	5.50	1.00	15.5	0.60	6.0
27	2.87	0.50e	1.65	2.60	0.90	12.5	0.70	7.6
28	3.05	0.38	1.45	1.50	0.75	8.7	1.35	28.0
29	3.05	0.38	2.05	12.00	0.75	8.7	1.32	26.0
30	3.10	0.68			0.70	7.6	1.36	28.0
31	3.15	1.02			0.70	7.6		

e Discharge estimated January 9 and January 15 to 27 during spring break-up March 7 to 22.

d Actual measurement.

b-b Ice conditions discharge estimated and computed by Bolster method.

DAILY GAUGE HEIGHT AND DISCHARGE of Little Bow ditch from Highwood River, for 1916.—*Concluded.*

DAY	May		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	1.40	30	3.27	128	1.70	42.0
2.....	1.40	30	3.27	128	1.80	46.0
3.....	1.37	28	3.30	130	1.80	46.0
4.....	1.40	30	3.30	130	1.50	34.0
5.....	2.32	72	3.30	130	1.00	15.5
6.....	2.28	70	3.00	111	0.95	14.0
7.....	2.50	81	2.95	108	0.92	13.1
8.....	2.05	58	2.93	107	0.92	13.1
9.....	1.65	40	2.93	107	0.95	14.0
10.....	1.45	32	2.95	108	0.90	12.5
11.....	1.45	32	2.90	105	0.75	8.7
12.....	1.40	30	2.90	105	0.70	7.6
13.....	1.35	28	2.80	99	0.60	6.0
14.....	1.30	26	2.75	96	0.50	4.5
15.....	1.28	25	2.80	99	0.40	3.2
16.....	1.25	24	2.80	99	0.00	Nil
17.....	1.25	24	2.85	102		
18.....	1.25	24	2.90	105		
19.....	1.40	30	2.95	108		
20.....	1.28	25	2.95	108		
21.....	1.23	23	2.95	108		
22.....	1.23	23	2.80	99		
23.....	1.20	22	2.70	93		
24.....	1.40	30	2.70	93		
25.....	1.40	30	2.60	87		
26.....	1.35	28	2.55	84		
27.....	1.65	40	2.70	93		
28.....	1.90	51	2.70	93		
29.....	2.70	93	2.50	81		
30.....	3.00	111	1.95	53		
31.....	3.27	128				

Ditch works damaged by flood, ditch not used after July 15.

MONTHLY DISCHARGE of Little Bow ditch from Highwood River, for 1916

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	2.00	Nil	0.71			44
February.....	40.00	1.02	13.40			771
March.....	21.00	5.00	12.50			769
April.....	22.00	6.00	11.60			690
May.....	128.00	22.00	43.00			2,644
June.....	130.00	53.00	103.00			6,129
July (1-16).....	46.00	3.20	17.50			555
The period.....						11,602

SESSIONAL PAPER No. 25a

MEAN MONTHLY DISCHARGE in Second-feet of Little Bow ditch from High River

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		6.50	68.0	24.0	10.1	2.80	22.0	1,367
November.....		10.10 ^b	69.0	18.9	11.5	7.80	27.0	1,592
December.....				22.0	8.8	2.90	11.2	682
January.....			30.0	12.4	7.6	0.71	12.7	773
February.....			36.0	14.6	6.8	13.40	17.7	994
March.....	17.0 ^a	14.90 ^c	48.0	16.4	6.3	12.50	21.0	1,277
April.....	20.0	16.10	46.0	17.6	5.9	11.60	19.5	1,168
May.....	38.0	32.00	37.0	27.0	33.0	43.00	35.0	2,153
June.....	28.0	23.00	50.0	29.0	67.0	103.00	51.0	2,977
July.....	9.8	7.10	29.0	23.0	21.0	17.50 ^d	18.0	1,110
August.....	9.2	0.11	26.0	15.1	9.2		11.9	739
September.....	9.6	19.60	27.0	10.7	3.4		14.1	854
Total in Acre-feet...	7,177	6,890	28,203	13,934	11,504	12,416		15,686

^a 26-31.^b 1-15.^c 21-31.^d 1-16.

HIGHWOOD RIVER AT HIGH RIVER

Location.—On the NW. $\frac{1}{4}$ Sec. 6, Tp. 19, Rge. 28, W. 4th Mer., at the new steel traffic bridge in the town of High River.

Records available.—May 28, 1908, to December 31, 1915.

Gauge.—Chain gauge: Elevation of zero of gauge was 3,381.66 during 1908-13. Elevation of zero of gauge was 3,379.74 during 1914-16.

Bench-mark.—Permanent iron bench-mark 128 feet N. 60° E. and SE. corner of stream, face of right abutment; elevation 3,389.60 feet, Canadian Pacific Railway Company's datum.

Channel.—Fairly permanent.

Discharge measurements.—From bridge.

Diversions.—The Little Bow ditch diverts water about one mile above the station.

Observer.—Philip Weinard.

Remarks.—This station was abandoned April 1, 1916. Records on this stream are continued near Aldersyde.

DISCHARGE MEASUREMENTS of Highwood River at High River, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 6.....	F. K. Beach.....	104	281	0.48	3.94 ^b	136
Feb. 3.....	O. H. Hoover.....	100	244	0.21	4.02 ^b	51
Mar. 6.....	S. H. Frame.....	95	253	0.39	3.70 ^b	99
April 1.....	J. M. Paul.....	140	424	0.66	4.12	282
July 5.....	R. J. McGuinness.....	170	953	4.04	7.13	3,847

^b Ice conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Highwood River at High River, for 1916

DAY	January		February		March	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	3.68 ^b	131	4.05	54	3.41	103
2	3.75	132	4.00	52	3.64	102
3	3.80	134	4.00	51	3.90	101
4	4.00	135	4.00	51	3.70	100
5	4.05	136	4.05	51	3.75	99
6	3.94	136	4.05	51	3.68	99
7	3.77	136	4.00	51	3.67	99
8	3.93	136	4.05	51	3.65	100
9	4.00	136	3.95	51	3.69	102
10	3.93	136	3.96	51	4.33	150
11	4.00	136	3.97	51	5.15	180
12	3.73	136	3.87	51	5.40	180
13	3.86	136	3.87	52	4.55	200
14	3.92	136	3.83	56	4.20 ^b	280
15	3.90	136	3.77	90	4.05	230
16	4.00	135	6.14	500 ^e	4.05	230
17	3.91	135	5.95	450 ^e	4.07	240
18	3.85	134	5.10	400 ^e	4.05	230
19	3.86	133	4.70	300 ^e	4.00	220
20	3.80	132	4.28	280 ^e	4.85	250 ^e
21	3.82	129	4.15	260	4.85	250 ^e
22	4.10	124	4.10	210	4.80	240 ^e
23	3.80	118	4.05	160	4.10	235
24	4.00	104	3.85	124	4.05	230
25	3.95	90	3.76	114	3.85	180
26	3.95	82	3.75	111	4.05	230
27	4.00	75	3.56	109	4.05	230
28	4.05	68	3.63	107	4.05	230
29	4.00	64	3.61	105	4.00	220
30	4.05	60	.....	.....	4.00	220
31	4.05	56	.....	.....	4.10	235

b-b Ice conditions.

e Discharge estimated.

MONTHLY DISCHARGE of Highwood River at High River, for 1916

(Drainage area 746 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January	136	56	118	0.158	0.18	7,256
February	500	51	139	0.186	0.20	7,995
March	280	99	187	0.251	0.29	11,498
The period	.....	.....	.....	.....	0.67	26,749

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet, of Highwood River at High River

MONTH	1907-S	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	Mean in Sec.-ft.	Mean in Acre-ft.
October		221	146	*341	412	221	273	293	357	283	17,400
November					c186	d174	195	165	173	178	10,574
December							86	82	141	351	6,333
January							69	85	118	91	5,575
February							51	74	139	88	4,979
March							66	66	187	106	6,538
April		187	258	182	300	318	264	255		266	12,562
May		1,568	856	790	732	768	880	1,968		1,080	66,422
June	a4,164	2,652	953	1,844	1,275	1,478	1,209	2,879		1,756	104,471
July		1,516	*398	612	1,172	702	550	1,973		989	60,823
August	342	548	*191	860	627	528	173	796		508	31,166
September	196	224	*351	984	293	319	140	351		357	21,252
Total in acre-feet ..	255,644	419,143	190,822	341,248	296,296	253,828	239,354	544,912			348,093

a 1-27.

* Includes Little Bow ditch.

b 22-31.

c 1-13.

d 1-23.

HIGHWOOD RIVER NEAR ALDERSYDE

Location.—On NW. $\frac{1}{4}$ Sec. 17, Tp. 20, Rge. 28, W. 4th Mer., at L. W. Barret's ranch about three miles northeast of Aldersyde.

Records available.—From October 3, 1911, to December 31, 1916.

Gauge.—Standard chain gauge. The elevation of zero has been maintained at 90.64 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Probably permanent. Large stones and boulders in and near section.

Discharge measurements.—From traffic bridge or by wading.

Observer.—L. W. Barret.

DISCHARGE MEASUREMENTS of Highwood river near Aldersyde, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 5	J. M. Paul	95	236	1.99	1.98	470
May 6	W. M. Edwards	172	396	3.15	2.45	1,250
May 31	do	220	739	4.70	3.89	3,470
June 20	R. J. McGuinness	233	1,146	6.24	5.64	7,144
June 24	do	224	719	5.18	4.00	3,728
July 5	do	224	766	5.54	4.42	4,248
July 28	W. M. Edwards	173	351	2.93	2.24	1,030
Aug. 24	do	192	419	3.47	2.68	1,457
Oct. 23	W. H. Hannan	153	282	2.10	1.84	593
Dec. 1	W. M. Edwards	150	343	0.62	2.82b	211
Dec. 18	do	139	237	0.70	2.70b	165

b Ice conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Highwood river near Aldersyde, for 1916

DAY	March		April		May		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	2.69	120e	2.23	450	2.14	907	4.17	3,946	4.38	4,337
2.....	2.67	135	3.21	330	2.17	938	3.90	3,460	5.34	6,396
3.....	2.70	150	2.79	400	2.04	805	4.10	3,820	.....	5,812
4.....	2.75	165	2.62	450	2.13	896	4.73	5,038	4.82	5,228
5.....	2.77	180	1.98	470e	2.27	1,047	5.30	6,300	4.20	4,000
6.....	2.75	195	1.56	385	2.44	1,245	4.93	5,464	4.06	3,748
7.....	2.73	210	1.64	447	2.52	1,346	4.36	4,299	3.81	3,302
8.....	2.75	225	1.70	495	2.57	1,411	4.00	3,640	3.73	3,166
9.....	2.81	230	1.68	479	2.36	1,149	4.35	4,280	3.82	3,320
10.....	2.84	250	1.65	455	2.28	1,068	4.45	4,472	3.72	3,149
11.....	4.42	200	1.66	463	2.24	1,014	4.15	3,910	3.45	2,692
12.....	4.38	210	1.64	447	2.10	865	3.78	3,251	3.33	2,498
13.....	4.05	220	1.58	400	2.06	825	3.70	3,115	3.12	2,175
14.....	3.69	230	1.56	385	2.04	805	3.74	3,183	3.08	2,116
15.....	3.66	240	1.60	415	2.02	785	4.45	4,472	2.93	1,898
16.....	3.61	250	1.69	487	2.06	825	5.42	6,589	2.80	1,715
17.....	3.54	260	1.67	471	2.07	835	5.80	7,550	2.76	1,661
18.....	3.43	270	1.64	447	2.05	815	5.75	7,420	2.48	1,295
19.....	3.23	280	1.62	431	2.08	845	6.03	8,186	2.69	1,567
20.....	3.15	290	1.56	385	2.18	949	5.64	7,137	2.61	1,463
21.....	3.32	280	1.53	362	2.27	1,047	5.10	5,835	2.53	1,359
22.....	3.57	270	1.51	348	2.30	1,080	4.96	5,529	2.45	1,258
23.....	3.06	290	1.51	348	2.33	1,114	4.28	4,148	2.43	1,232
24.....	2.94	310	1.50	340	2.42	1,220	4.00	3,640	2.33	1,114
25.....	.....	300	1.48	326	2.44	1,245	3.90	3,460	2.27	1,047
26.....	3.23	320	1.53	362	2.48	1,296	4.13	3,874	2.29	1,069
27.....	2.55	340	1.66	463	2.45	1,258	4.82	5,228	2.37	1,160
28.....	2.57	360	1.85	625	2.61	1,463	5.96	7,988	2.24	1,014
29.....	2.43	380	2.06	825	3.35	2,530	6.68	10,232	2.18	949
30.....	2.44	400	2.05	815	3.87	3,408	5.48	6,736	2.10	865
31.....	2.41	420	.....	.....	3.89	3,442	.....	.....	2.07	835

e-e Discharge estimated during breakup from field inspection.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Highwood river near Aldersyde, for 1916—*Concluded*

DAY	August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	2.05	815	2.12	886	1.84	616	1.66	463	2.82	1,743
2	2.03	795	2.07	835	1.85	625	1.68	479	3.52 ^b	209
3	2.00	765	2.04	805	1.83	607	1.67	471	3.56	207
4	1.97	736	2.51	1,333	1.78	563	1.66	463	3.67	204
5	2.04	805	3.27	2,404	1.75	538	1.64	447	3.49	202
6	2.02	785	3.06	2,087	1.86	634	1.65	455	3.45	199
7	1.94	708	2.56	1,398	1.95	718	1.64	447	3.34	197
8	1.82	598	2.34	1,126	1.87	643	1.42	284	3.02	195
9	2.00	765	2.26	1,036	1.82	598	1.37	249	2.60	191
10	2.43	1,232	2.21	981	1.80	580	1.39	263	2.51	189
11	2.30	1,080	2.17	938	1.78	563	1.44	298	2.34	187
12	2.13	896	2.08	845	1.77	554	1.46	312	2.46	184
13	2.00	765	2.05	815	1.75	538	1.42	284	2.37	180
14	1.93	698	2.05	815	1.75	538	1.38	256	2.90	177
15	1.88	652	2.03	795	1.77	554	1.84	616	2.74	175
16	1.84	616	2.01	775	1.78	563	1.93	698	2.71	172
17		860 ^e	1.98	746	1.80	580	1.91	680	2.74	169
18	2.32	1,103	1.94	708	1.86	634	1.87	643	2.67	165
19	6.05	8,242	1.90	670	1.80	580	1.45	305	2.58	163
20	3.31	2,466	1.86	634	1.78	563	1.92	689	2.62	159
21	2.79	1,702	1.82	598	1.80	580	1.98	746	2.49	156
22	2.61	1,463	1.80	580	1.91	680	1.76	546	2.34	153
23	2.57	1,411	1.77	554	1.82	598	1.74	529	2.32	149
24	2.70	1,580	1.76	546	1.85	625	1.90	670	2.30	147
25	2.55	1,385	1.75	538	1.87	643	1.87	643	2.54	144
26	2.49	1,308	1.75	538	1.86	634	1.77	554	2.33	141
27	2.34	1,126	1.79	572	1.83	607	1.79	572	2.47	139
28	2.30	1,080	1.77	554	1.81	589	1.96	727	2.42	137
29	2.30	1,080	1.74	529	1.72	512	2.04	805	2.45	135
30	2.28	1,058	1.72	512		496 ^e	2.57	1,411	2.59	134
31	2.15	918				480 ^e			2.61 ^b	134

b-b Ice conditions.

e Discharge estimated.

MONTHLY DISCHARGE of Highwood river near Aldersyde, for 1916

(Drainage area 883 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March	420	120	257	0.291	0.34	15,802
April	825	326	450	0.510	0.57	26,777
May	3,442	785	1,241	1.400	1.61	76,288
June	10,232	3,115	5,207	5.900	6.58	309,705
July	6,396	835	2,369	2.680	3.09	145,629
August	8,242	598	1,274	1.440	1.66	78,317
September	2,404	512	872	0.988	1.10	51,888
October	718	312	588	0.666	0.77	36,155
November	1,411	249	534	0.605	0.68	31,775
December	1,743	134	220	0.249	0.29	13,527
The period					16.69	785,863

MEAN MONTHLY DISCHARGE in Second-feet of Highwood river near Aldersdyde

MONTH	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		270	322	302	422	588	381	23,419
November.....						534	534	31,775
December.....						220	220	13,527
January.....								
February.....								
March.....				76c	257		257	15,802
April.....		511b	262	257	450		323	19,220
May.....		720	884	2,099	1,241		1,236	75,993
June.....	1,692	1,703	1,300	3,382	5,207		2,657	158,061
July.....	1,642	1,060	642	2,406	2,369		1,624	99,834
August.....	751	406	187	1,000	1,274		724	44,485
September.....	347a	324	149	462	872		452	26,881
Total in acre-ft.....	260,160	287,872	226,939	603,361	730,354			508,997

a 13-30.

b 15-30.

c 17-31.

CANADIAN PACIFIC RAILWAY COMPANY CANAL (NORTH BRANCH)
NEAR BASSANO

Location.—On NW. $\frac{1}{4}$ Sec. 3, Tp. 21, Rge. 18, W. 4th Mer., about three miles southeast of the town of Bassano, and about three and one-half miles east of the Bassano dam.

Records available.—From May 1, 1914, to November 4, 1916.

Gauge.—Vertical staff in stilling box; zero of gauge is at elevation of floor of rating flume at measuring section, 90.54 feet.

Bench-mark.—Top of left abutment of gauging bridge, assumed elevation 100.00 feet.

Channel.—Permanent concrete section.

Discharge measurements.—From gauging bridge or by wading underneath.

Winter flow.—Ditch closed off at freeze-up.

Artificial control.—Discharge at station may be affected by the operation of the headgates about 400 feet above the station.

Co-operation.—Gauge heights supplied by Canadian Pacific Railway Company. The Company also furnishes the results of their gaugings.

DISCHARGE MEASUREMENTS of Canadian Pacific Railway Company canal (N. Branch) near
Bassano, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 16.....	Canadian Pacific Railway...	32.8	27.9	1.10	0.90	31.0
May 18.....	H. C. Ritchie.....	34.0	46.5	1.34	1.44	62.0
June 8.....	do.....	31.5	23.8	0.93	0.70	23.0
June 14.....	Canadian Pacific Railway...	31.4	16.7	0.93	0.55	15.4
June 28.....	do do.....	34.5	43.1	1.53	1.35	66.0
July 10.....	H. C. Ritchie.....	32.0	24.0	1.23	0.71	31.0
July 13.....	Canadian Pacific Railway...	30.8	12.0	1.18	0.40	14.1
July 18.....	L. E. Kendall.....	32.0	21.6	1.14	0.70	25.0
Aug. 1.....	H. C. Ritchie.....	33.5	34.4	1.33	1.04	46.0
Aug. 7.....	Canadian Pacific Railway...	33.4	32.9	1.22	1.05	40.0
Aug. 21.....	H. C. Ritchie.....	31.0	17.7	0.98	0.60	17.2
Sept. 11.....	Canadian Pacific Railway...	32.6	26.3	1.33	0.85	35.0
Sept. 12.....	H. C. Ritchie.....	32.0	24.0	1.09	0.74	28.0
Oct. 11.....	do.....	30.0	11.8	0.76	0.36	9.0
Oct. 17.....	Canadian Pacific Railway...	33.0	29.6	1.40	0.95	41.0
Nov. 2.....	H. C. Ritchie.....	31.0	14.8	0.93	0.49	13.7
Nov. 4.....	Canadian Pacific Railway...	31.2	15.1	1.06	0.50	16.0

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Canadian Pacific Railway Company canal (N. Branch)
near Bassano, for 1916

DAY	May		June		July	
	Gauge Height	Dis- charge	Gauge Height	Dis- charge	Gauge Height	Dis- charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	0.80	28	0.65	21.0	1.35	63.0
2.....	0.80	28	0.65	21.0	1.30	59.0
3.....	0.80	28	0.65	21.0	1.30	59.0
4.....	0.90	34	0.65	21.0	0.80	28.0
5.....	0.90	34	0.70	23.0	0.80	28.0
6.....	1.20	52	0.65	21.0	0.80	28.0
7.....	0.90	34	0.65	21.0	0.75	26.0
8.....	0.80	28	0.65	21.0	0.70	23.0
9.....	0.90	34	0.65	21.0	0.65	21.0
10.....	0.90	34	0.65	21.0	0.60	18.3
11.....	0.90	34	0.65	21.0	0.40	10.4
12.....	0.80	28	0.65	21.0	0.40	10.4
13.....	0.80	28	0.65	21.0	0.40	10.4
14.....	0.80	28	0.55	16.2	0.40	10.4
15.....	0.80	28	0.45	12.2	0.40	10.4
16.....	0.80	28	1.00	40.0	0.40	10.4
17.....	0.90	34	1.00	40.0	0.40	10.4
18.....	1.30	59	1.00	40.0	0.40	10.4
19.....	1.30	59	1.30	59.0	0.60	18.3
20.....	1.30	59	1.30	59.0	0.60	18.3
21.....	1.30	59	1.35	63.0	0.80	28.0
22.....	1.30	59	1.35	63.0	0.80	28.0
23.....	1.30	59	1.35	63.0	0.80	28.0
24.....	1.35	63	1.35	63.0	0.80	28.0
25.....	1.30	59	1.35	63.0	0.80	28.0
26.....	1.25	55	1.35	63.0	0.75	26.0
27.....	1.25	55	1.35	63.0	0.80	28.0
28.....	1.25	55	1.35	63.0	0.75	26.0
29.....	1.25	55	1.35	63.0	0.75	26.0
30.....	0.80	28	1.35	63.0	0.80	28.0
31.....	0.80	28			0.60	18.3

Head-gates opened May 1.

DAILY GAUGE HEIGHT AND DISCHARGE of Canadian Pacific Railway Company canal (N. Branch)
near Bassano, for 1916—*Concluded*

DAY	August		September		October		November	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	1.00	40.0	0.30	7.3	0.40	10.4	0.55	16.1
2.....	0.85	31.0	0.40	10.4	0.35	8.9	0.60	18.3
3.....	1.20	52.0	0.40	10.4	0.30	7.3	0.60	18.3
4.....	1.20	52.0	0.40	10.4	0.30	7.3	0.60	18.3
5.....	1.20	52.0	0.40	10.4	0.40	10.4		
6.....	1.20	52.0	0.60	18.3	0.40	10.4		
7.....	1.20	52.0	0.60	18.3	0.40	10.4		
8.....	1.20	52.0	0.70	23.0	0.40	10.4		
9.....	0.70	23.0	0.70	23.0	0.20	4.6		
10.....	0.65	21.0	0.85	31.0	0.20	4.6		
11.....	0.60	18.3	0.80	28.0	0.20	4.6		
12.....	0.60	18.3	0.70	23.0	0.20	4.6		
13.....	0.60	18.3	0.55	16.1	0.20	4.6		
14.....	0.60	18.3	0.40	10.4	0.20	4.6		
15.....	0.60	18.3	0.38	9.8	0.90	34.0		
16.....	0.60	18.3	0.35	8.9	0.90	34.0		
17.....	0.60	18.3	0.30	7.3	0.90	34.0		
18.....	0.60	18.3	0.50	14.0	1.00	40.0		
19.....	0.60	18.3	0.50	14.0	1.05	43.0		
20.....	0.40	10.4	0.50	14.0	0.90	34.0		
21.....	0.60	18.3	0.45	12.2	0.90	34.0		
22.....	0.40	10.4	0.45	12.2	0.50	14.0		
23.....	0.50	14.0	0.43	11.5	0.50	14.0		
24.....	0.70	23.0	0.45	12.2	0.50	14.0		
25.....	1.10	46.0	0.48	13.3	0.55	16.1		
26.....	1.10	46.0	0.40	10.4	0.50	14.0		
27.....	1.10	46.0	0.40	10.4	0.50	14.0		
28.....	1.10	46.0	0.48	13.3	0.45	12.2		
29.....	0.40	10.4	0.30	7.3	0.50	14.0		
30.....	0.40	10.4	0.30	7.3	0.50	14.0		
31.....	0.40	10.4			0.50	14.0		

Head-gates closed Nov. 4.

MONTHLY DISCHARGE of Canadian Pacific Railway Company canal (N. Branch) near Bassano,
for 1916

MONTH	DISCHARGE IN SECOND-FEET			Total Discharge in acre-ft
	Maximum	Minimum	Mean	
May.....	63.0	28.0	42.0	2,582
June.....	63.0	12.2	39.0	2,321
July.....	63.0	10.4	25.0	1,537
August.....	52.0	10.4	28.0	1,722
September.....	31.0	7.3	13.9	827
October.....	43.0	4.6	16.0	983
November (1-4).....	18.3	16.1	17.8	141
The period.....				10,113

SESSIONAL PAPER No. 25a

CANADIAN PACIFIC RAILWAY COMPANY CANAL (EAST BRANCH) NEAR BASSANO

Location.—On SE. $\frac{1}{4}$ Sec. 3, Tp. 21, Rge. 18, W. 4th Mer., about four hundred feet from headgates of East Branch and about three and one-half miles east of the Bassano dam.

Records available.—May 28, 1914, to December 31, 1916.

Gauge.—Vertical staff in stilling box; zero of gauge is at elevation of floor of rating flume at measuring section, 87.67 feet.

Bench-mark.—Top of left abutment of gauging bridge; assumed elevation 100.00 feet.

Channel.—Permanent concrete section.

Discharge measurements.—From gauging bridge or by wading below.

Winter flow.—Water was diverted in January and February into this ditch in order to fill the reservoir at Lake Newell.

Artificial control.—Discharge may be affected by the operation of the headgates above station.

Co-operation.—Gauge heights supplied by the Canadian Pacific Railway Company, and Company also furnishes results of their gaugings.

DISCHARGE MEASUREMENTS of Canadian Pacific Railway Company canal (East Branch)
near Bassano, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 4	Canadian Pacific Railway Co.	80.5	176.4	1.01	2.70	179.0
Jan. 12	F. K. Beach	76.0	224.0	1.00	3.49	224.0
Jan. 21	Canadian Pacific Railway Co.	80.5	186.6	1.06	2.70	197.0
Mar. 12	E. J. Switzer	72.0	101.0	0.79	1.38	79.0 ^x
April 6	H. C. Ritchie	68.0	10.9	0.93	0.20	10.1 ^x
May 18	do	74.0	127.0	1.12	1.82	142.0
June 8	do	70.0	46.3	0.70	0.68	33.0
June 14	Canadian Pacific Railway Co.	72.9	57.0	1.11	0.80	63.0
July 10	H. C. Ritchie	71.0	79.0	0.74	1.15	58.0
July 13	Canadian Pacific Railway Co.	74.3	82.8	0.68	1.15	57.0
Aug. 1	H. C. Ritchie	72.0	85.0	0.73	1.21	62.0
Aug. 7	Canadian Pacific Railway Co.	74.4	84.3	0.68	1.17	68.0
Aug. 21	H. C. Ritchie	71.5	72.6	0.66	1.08	48.0
Sept. 12	do	72.0	75.3	0.64	1.08	48.0
Sept. 16	Canadian Pacific Railway Co.	75.0	96.2	1.18	1.33	113.0
Oct. 11	H. C. Ritchie	72.0	83.6	0.68	1.19	57.0
Oct. 17	Canadian Pacific Railway Co.	75.5	105.3	1.22	1.45	128.0
Nov. 2	H. C. Ritchie	71.0	61.0	0.47	0.90	29.0
Nov. 4	Canadian Pacific Railway Co.	72.5	49.8	0.62	0.70	31.0
Nov. 8	Canadian Pacific Railway Co.	78.5	163.0	1.37	2.20	223.0
Nov. 22	H. C. Ritchie	69.0	37.8	1.43	0.55	54.0

^x Head-gates closed; melting snow and ice.

DAILY GAUGE HEIGHT AND DISCHARGE of Canadian Pacific Railway Company canal (E. Branch)
near Bassano, for 1916

	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	2.90	150	3.40	240	.....	.....	.....	.....	0.87	55	1.28	93
2....	2.90	150	3.40	258	.....	.....	.....	.....	0.87	55	1.28	93
3....	2.90	153	3.50	280	.....	.....	.....	.....	0.87	55	1.28	93
4....	2.95	163	3.60	304	.....	.....	.....	.....	0.87	55	1.28	93
5....	3.00	179	3.70	316	.....	.....	.....	.....	0.87	55	1.28	93
6....	3.20	194	3.20	280	.....	.....	.....	.....	0.87	55	1.28	93
7....	3.35	207	2.90	190	.....	.....	.....	.....	0.87	55	0.58	33
8....	3.40	214	2.60	137	.....	.....	.....	.....	0.67	39	0.59	33
9....	3.50	220	2.60	123	.....	.....	.....	.....	0.57	32	0.59	33
10....	3.50	224	2.60	105	.....	.....	.....	.....	0.47	25	0.59	33
11....	3.50	225	2.50	98	.....	.....	.....	.....	0.37	19	0.59	33
12....	3.50	224	2.80	170	.....	.....	.....	.....	1.07	72	0.59	33
13....	3.10	180	2.60	136	.....	.....	.....	.....	0.97	63	0.59	33
14....	3.00	170	2.80	170	.....	.....	.....	.....	0.97	63	0.79	48
15....	3.00	170	3.00	230	.....	.....	.....	.....	1.07	72	0.79	48
16....	3.00	170	3.40	370	.....	.....	.....	.....	1.32	97	0.79	48
17....	3.00	170	3.60	450	.....	.....	.....	.....	1.57	127	0.79	48
18....	3.00	172	3.60	462	.....	.....	.....	.....	0.97	63	0.79	48
19....	3.10	175	3.60	462	.....	.....	.....	.....	0.37	19	0.79	48
20....	3.10	184	3.60	450	.....	.....	.....	.....	0.87	55	0.89	56
21....	3.20	198	2.80	210	.....	.....	.....	.....	1.77	155	0.79	48
22....	3.20	230	3.50	375	.....	.....	.....	.....	1.57	127	0.69	40
23....	3.20	256	3.50	385	.....	.....	.....	.....	1.37	103	0.59	33
24....	3.30	262	3.50	380	.....	.....	.....	.....	1.37	103	0.49	26
25....	3.35	263	3.00	300	.....	.....	.....	.....	1.37	103	0.59	33
26....	3.30	220	2.80	180	.....	.....	.....	.....	1.37	103	0.99	65
27....	3.20	220	2.40	50	.....	.....	.....	.....	1.37	103	0.99	65
28....	3.30	235	2.40	35	.....	.....	.....	.....	1.37	103	1.09	74
29....	3.20	216	.....	.....	.....	.....	.....	.....	1.38	104	1.14	79
30....	3.20	210	.....	.....	.....	.....	.....	.....	1.28	93	1.14	79
31....	3.20	212	.....	.....	.....	.....	.....	.....	1.28	93	.....	.....

Head-gates closed March 1 to April 30.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Canadian Pacific Railway Company canal (E. Branch)
near Bassano, for 1916.—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	1.15	80	1.10	75	0.57	32	0.88	55	0.88	55	0.37	19
2.....	1.15	80	1.10	75	0.52	28	0.93	60	1.23	88	0.87	55
3.....	1.15	80	1.20	85	1.15	80	0.88	55	1.18	83	.....	.....
4.....	1.10	75	1.20	85	1.15	80	0.68	40	1.18	83	.....	.....
5.....	1.10	75	1.20	85	1.17	82	0.68	40	1.28	93	.....	.....
6.....	1.10	75	1.10	75	1.12	77	0.78	47	1.38	104	.....	.....
7.....	1.10	75	1.10	75	0.95	62	1.18	83	1.28	93	.....	.....
8.....	1.10	75	1.10	75	1.02	68	1.58	128	2.08	204	.....	.....
9.....	1.10	75	0.90	57	1.07	72	1.49	117	1.98	188	.....	.....
10.....	1.10	75	1.30	95	1.04	70	1.54	123	1.38	104	.....	.....
11.....	1.10	75	1.29	94	1.29	94	1.59	130	1.18	83	.....	.....
12.....	1.10	75	0.89	56	1.61	132	1.59	130	0.98	64	.....	.....
13.....	1.15	80	1.09	74	1.56	126	1.59	130	0.28	14	.....	.....
14.....	1.15	80	1.19	84	1.61	132	1.59	130	0.28	14	.....	.....
15.....	1.15	80	1.24	89	1.61	132	2.04	197	0.58	33	.....	.....
16.....	1.15	80	1.09	74	1.29	94	1.49	117	0.83	51	.....	.....
17.....	1.15	80	1.14	79	2.06	201	2.04	197	0.68	40	.....	.....
18.....	1.15	80	0.54	30	2.51	276	1.49	117	0.58	33	.....	.....
19.....	1.15	80	0.99	65	1.46	113	1.29	94	0.58	33	.....	.....
20.....	1.15	80	1.04	70	1.11	76	1.24	89	0.57	32	.....	.....
21.....	1.15	80	1.06	71	1.02	68	1.29	94	0.72	43	.....	.....
22.....	1.15	80	1.08	73	1.02	68	1.49	117	0.77	47	.....	.....
23.....	1.15	80	1.06	71	1.12	77	1.49	117	0.37	19	.....	.....
24.....	1.10	75	1.20	85	1.22	87	1.49	117	0.37	19	.....	.....
25.....	1.15	80	1.08	73	0.97	63	1.44	111	0.57	32	.....	.....
26.....	1.10	75	1.23	88	1.22	87	1.29	94	0.57	32	.....	.....
27.....	1.15	80	1.16	81	1.17	82	1.04	70	0.52	28	.....	.....
28.....	1.10	75	1.13	78	0.82	51	0.99	65	0.27	14	.....	.....
29.....	1.10	75	1.23	88	1.07	72	0.49	26	0.42	22	.....	.....
30.....	1.10	75	1.28	93	1.07	72	0.59	33	0.47	25	.....	.....
31.....	1.10	75	0.76	46	.....	.....	0.73	43	.....	.....	.....	.....

Head-gates closed December 3-31

MONTHLY DISCHARGE of Canadian Pacific Railway Company canal (East Branch)
near Bassano, for 1916

MONTH	DISCHARGE IN SECOND-FEET			Total Discharge in Acre-ft
	Maximum	Minimum	Mean	
January.....	263	150	201	12,359
February.....	462	35	255	14,162
March.....	.....	.....	.....	.....
April.....	.....	.....	.....	.....
May.....	155	19	75	4,612
June.....	93	26	56	3,332
July.....	80	75	78	4,796
August.....	95	30	75	4,612
September.....	276	28	92	5,474
October.....	197	26	96	5,903
November.....	204	14	59	3,511
December (1-2).....	55	9	37	147
The period.....	.....	.....	.....	58,908

BOW RIVER NEAR BASSANO

Location.—On SE. $\frac{1}{4}$ of Sec. 2, Tp. 21, Rge. 19, W. 4th Mer., about one-half mile down stream from Canadian Pacific Railway Company's dam, and about three miles southwest of the town of Bassano.

Records available.—August 20, 1909, to December 31, 1916.

Gauge.—Vertical staff, on left bank at gauging station. Elevation of zero of gauge 2,519.43 feet during 1909-10; elevation of zero of gauge 2,517.90 feet during 1911-12; elevation of zero of gauge 2,513.60 feet during 1913; elevation of zero of gauge 2,510.68 feet during 1914-16.

Bench-mark.—Permanent iron bench-mark, elevation 2,524.29 feet (Canadian Pacific Railway Company's datum).

Channel.—Permanent.

Discharge measurements.—Made from a cable.

Winter flow.—Records taken during winter season.

Diversions.—Water for the Eastern Section of Canadian Pacific Railway Company's irrigation tract is diverted about one-half mile up stream.

Co-operation.—Gauge heights supplied by Canadian Pacific Railway Company.

DISCHARGE MEASUREMENTS of Bow river near Bassano, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Feb. 10.	J. M. Paul.	484	1,582	0.80	3.71	1,270
Mar. 11.	E. J. Switzer.	30			0.05	20 ^e
Mar. 12.	do.	585	2,462	1.61	3.52	3,978
April 6.	H. C. Ritchie.	600	3,055	2.62	4.69	8,000 ^e
April 27.	do.	600	3,055	2.62	4.69	8,000 ^e
May 19.	do.	585	2,514	1.51	3.26	3,800
June 8.	do.	622	4,515	4.05	6.60	18,284
June 8.	W. H. Storey.	622	4,603	4.06	6.60	18,688 ^x
June 22.	L. E. Kendall.	620	7,106	6.24	10.87	44,340 ^x
June 23.	do.	620	6,862	6.08	10.47	41,738
June 24.	do.	618	5,697	5.52	8.60	31,470
June 27.	do.	618	5,392	5.28	8.08	28,470
July 11.	H. C. Ritchie.	620	5,518	5.46	8.16	30,147
Aug. 2.	do.	598	3,411	2.68	4.76	9,146
Aug. 22.	do.	610	4,396	3.88	6.31	17,055
Sept. 12.	do.	605	3,801	2.92	5.24	11,102
Oct. 11.	do.	596	2,888	1.89	3.87	5,460
Nov. 2.	do.	595	2,698	1.63	3.54	4,394
Nov. 23.	do.	530			3.28	3,800 ^e
Dec. 12.	W. K. Broughton.	520	2,100	0.80	2.03	1,680 ^e

^e Estimated discharge

^x Slope measurement.

Pool at dam was being filled on Mar. 11.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Bow river near Bassano, for 1916

Day	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	1.65 ^b	920	3.40	1,180	2.55	1,300	.....	2,750	.....	2,940	7.56	24,317
2.....	1.55	950	3.40	1,190	2.45	1,300	.....	2,800	.....	3,250	7.46	23,689
3.....	1.55	960	3.45	1,190	2.45	1,300	.....	3,150	.....	3,040	6.66	18,760
4.....	1.55	995	3.45	1,190	2.45	1,300	.....	3,400	.....	3,020	7.16	21,805
5.....	1.65	990	3.55	1,195	2.40	1,300	.....	3,380	.....	4,070	7.56	24,317
6.....	1.75	990	3.65	1,200	2.35	1,330	.....	3,300	.....	4,050	7.66	24,945
7.....	1.95	995	3.75	1,230	2.25	1,360	.....	3,350	.....	4,300	6.96	20,560
8.....	2.15	1,005	3.75	1,250	2.35	1,400	.....	3,050	.....	4,550	6.58	18,280
9.....	2.35	1,035	3.80	1,260	2.60	1,500	.....	3,110	.....	5,160	6.51	17,860
10.....	2.55	1,055	3.71	1,260	2.40 ^b	1,560	.....	3,200	.....	4,800	6.56	18,160
11.....	2.75	1,080	3.75	1,290	.....	1,620 ^e	.....	3,240	.....	4,810	6.86	19,960
12.....	2.75	1,100	3.75	1,310	.....	1,660	.....	3,220	.....	4,200	7.66	24,945
13.....	2.70	1,130	3.75	1,290	.....	1,800	.....	3,170	.....	4,110	7.96	26,829
14.....	2.55	1,140	3.85	1,250	.....	1,800	.....	3,020	.....	3,940	8.06	27,457
15.....	2.55	1,070	3.75	1,150	.....	1,900	.....	3,030	.....	3,910	8.15	28,022
16.....	2.55	970	3.60	1,050	.....	1,920	.....	3,040	.....	3,840 ^e	8.35	29,278
17.....	2.55	850	3.55	980	.....	1,940	.....	3,000	3.37	3,625	8.15	28,022
18.....	2.55	760	3.75	970	.....	1,960	.....	3,090	3.35	3,575	8.35	29,278
19.....	2.60	695	4.25	1,000	.....	2,050	.....	2,880	3.32	3,500	9.97	39,442
20.....	2.55	670	3.80	1,250	.....	2,200	.....	2,910	3.24	3,300	10.37	41,954
21.....	2.75	700	3.60	1,080	.....	2,350	.....	2,810	3.67	4,410	10.27	41,326
22.....	2.70	750	3.00	1,050	.....	2,400	.....	2,740	3.72	4,560	10.87	45,094
23.....	2.65	900	2.80	1,045	.....	2,430	.....	2,760	3.77	4,710	9.77	38,186
24.....	3.15	1,070	3.10	1,030	.....	2,450	.....	2,740	3.87	5,045	8.85	32,418
25.....	3.20	1,120	2.90	1,010	.....	2,500	.....	2,530	4.02	5,570	8.05	27,394
26.....	3.20	1,130	2.90	1,110	.....	2,520	.....	2,510	4.07	5,745	7.95	26,766
27.....	3.20	1,140	2.60	1,250	.....	2,550	.....	2,360	4.27	6,480	8.00	27,080
28.....	3.25	1,145	2.70	1,270	.....	2,600	.....	2,380	4.67	8,115	9.77	38,186
29.....	3.30	1,150	2.80	1,300	.....	2,660	.....	2,370	4.97	9,465	11.67	50,118
30.....	3.35	1,160	.....	.....	.....	2,720	.....	2,830	7.26	22,433	10.87	45,094
31.....	3.35	1,175	.....	.....	.....	2,750	.....	.....	7.21	22,119	.....	.....

^{b-b} Ice conditions.^e Discharge estimated from March 11 to May 16; estimates are based on a study of the discharge records of the Bow and Elbow rivers at Calgary, Highwood river at Aldersyde, Sheep river at Okotoks, and smaller tributaries. No gauge height records, because of repair work at dam.

DAILY GAUGE HEIGHT AND DISCHARGE of Bow river near Bassano, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1 . . .	10.47	42,582	4.98	9,510	5.06	9,870	3.88	5,080	3.63	4,290	2.79	2,160
2 . . .	9.77	38,186	4.88	9,060	5.06	9,870	3.98	5,430	3.58	4,150	2.79	2,140
3 . . .	9.07	33,790	4.73	8,385	5.16	10,320	4.08	5,780	3.48	3,900	2.79	2,120
4 . . .	10.07	40,070	5.48	11,940	5.26	10,800	3.98	5,430	3.43	3,775	2.69	2,100
5 . . .	9.87	38,814	5.18	10,410	7.76	25,573	3.88	5,080	3.38	3,650	2.69	2,060
6 . . .	9.07	33,790	4.78	8,610	7.46	23,689	3.88	5,080	3.38	3,650	2.69	2,040
7 . . .	8.86	32,481	4.88	9,060	7.16	21,805	3.88	5,080	3.38	3,650	2.59	2,020
8 . . .	7.86	26,201	4.77	8,565	6.26	16,360	3.68	4,440	3.33	3,525	2.59	2,000
9 . . .	7.86	26,201	4.67	8,115	5.96	14,580	3.38	3,650	3.18	3,160	2.59	1,980
10 . . .	8.16	28,085	4.77	8,565	5.67	12,985	4.68	8,160	3.09	2,980	2.39	1,650
11 . . .	8.11	27,771	5.47	11,885	5.52	12,160	4.13	5,955	3.18 ^b	2,910	1.99	1,210
12 . . .	7.96	26,829	5.67	12,985	5.37	11,350	3.58	4,150	2.58	2,010	1.89	1,160
13 . . .	7.76	25,573	5.27	10,850	4.37	6,880	3.58	4,150	2.08	1,330	1.85	1,190
14 . . .	7.56	24,317	5.06	9,870	4.87	9,015	3.48	3,900	2.18	1,400	1.95	1,280
15 . . .	7.56	24,317	4.76	8,520	5.12	10,140	3.28	3,400	2.28	1,600	2.35	1,480
16 . . .	6.96	20,560	4.76	8,520	5.17	10,365	3.58	4,150	2.38	1,750	2.55	1,780
17 . . .	6.81	19,660	4.66	8,070	5.07	9,915	3.68	4,440	2.78	2,350	2.65	2,000
18 . . .	6.66	18,760	4.76	8,520	5.17	10,365	3.88	5,080	2.88	2,500	2.75	2,040
19 . . .	6.76	19,360	4.56	7,640	4.67	8,115	3.78	4,740	2.88	2,550	2.95	2,030
20 . . .	7.01	20,863	9.45	36,186	4.47	7,280	3.58	4,150	3.08	2,850	2.95	2,000
21 . . .	6.57	18,220	8.55	30,534	4.42	7,080	3.68	4,440	3.18	2,990	3.15	1,980
22 . . .	6.37	17,020	6.35	16,900	4.37	6,880	3.68	4,440	3.33	2,990	3.15	1,970
23 . . .	5.97	14,635	5.95	14,525	4.07	5,745	3.48	3,900	3.28	2,980	3.55	1,960
24 . . .	5.77	13,535	5.75	13,425	4.17	6,095	3.58	4,150	3.18	2,930	3.35	1,950
25 . . .	5.67	12,985	5.95	14,525	4.17	6,095	3.38	3,650	2.98	2,790	3.15	1,930
26 . . .	5.57	12,435	5.85	13,975	4.07	5,745	4.10 ^a	5,850	2.98	2,550	2.95	1,860
27 . . .	5.52	12,160	5.75	13,425	3.97	5,395	4.68	8,160	2.78	2,290	3.25	1,780
28 . . .	5.47	11,885	5.55	12,325	3.87	5,045	4.48	7,320	2.88	2,280	3.55	1,650
29 . . .	5.47	11,885	5.35	11,250	3.87	5,045	3.98	5,430	2.78	2,230	3.35	1,550
30 . . .	5.33	11,150	5.25	10,750	3.77	4,710	3.68	4,440	2.78	2,190	3.25	1,530
31 . . .	5.18	10,410	4.95	9,375	.....	.....	3.58	4,150	.....	.....	3.08 ^b	1,550

^a Gauge height interpolated^{b-b} Ice conditions.

MONTHLY DISCHARGE of Bow river near Bassano, for 1916

(Drainage area 7,838 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January	1,175	670	994	0.127	0.15	61,119
February	1,310	970	1,167	0.149	0.16	67,127
March	2,750	1,300	1,949	0.249	0.29	119,839
April	3,400	2,360	2,937	0.375	0.42	174,764
May	22,433	2,940	5,717	0.729	0.84	351,525
June	50,118	17,860	29,318	3.740	4.17	1,744,542
July	42,582	10,410	23,049	2.941	3.39	1,417,228
August	36,186	7,640	12,138	1.549	1.79	746,336
September	25,573	4,710	10,309	1.315	1.46	613,428
October	8,160	3,400	4,944	0.631	0.73	303,994
November	4,290	1,330	2,806	0.358	0.40	166,999
December	2,160	1,160	1,811	0.231	0.27	111,354
The year . . . . .	.....	.....	.....	.....	14.07	5,878,225

SESSIONAL PAPER No. 25b

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Bow river drainage basin, in 1916

Date	Engineer	Stream	Location	Width	Area of Section	Mean Velocity	Discharge
				<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
July 26	Kendall and McGuinness	Can. Pac. Ry. Co. Canal at Antelope creek, syphon	SE. 8-18-16-4	36.8	27.80	0.84	23.00
July 22	H. C. Ritchie	Beaupre creek	SE. 15-26-5-5	13.0	13.90	1.40	19.40
Aug. 8	do	do	do	12.0	3.60	0.83	3.00
Sept. 22	do	do	do	16.0	8.40	1.01	8.40
July 22	do	Bighill creek	SW. 10-26-1-5	19.0	19.20	2.85	55.00
Aug. 8	do	do	do	19.0	15.00	2.55	38.00
Sept. 28	do	do	do	21.0	17.60	2.34	41.00
July 27	W. M. Edwards	Fish creek (N. Br.)	NE. 22-22-3-5	29.0	29.10	1.08	31.00
Aug. 26	do	do do	do	28.0	25.60	1.43	37.00
Oct. 25	W. H. Hannan	do do	do	30.0	29.15	1.39	41.00
July 27	W. M. Edwards	do (S. Br.)	NE. 22-22-3-5	36.0	39.05	1.26	49.00
Aug. 26	do	do do	do	42.0	45.90	1.69	78.00
Oct. 25	W. H. Hannan	do do	do	35.0	32.10	1.57	50.00
July 22	H. C. Ritchie	Grand Valley creek	SW. 24-26-5-5	14.0	5.80	0.91	5.30
Aug. 8	do	do	do	15.0	9.60	0.74	7.10
Sept. 22	do	do	do	15.0	12.20	2.17	26.00
July 22	do	Horse creek	NE. 8-26-4-5	15.0	13.10	0.90	11.80
Aug. 8	do	do	do	15.6	8.30	0.72	5.90
Sept. 28	do	do	do	18.0	10.40	1.34	13.90
Mar. 28	do	Overflow, Power House, Lake Louise	NE. 20-28-16-5				0.86z
May 30	do	do	do				8.60z
June 23	do	do	do				12.40z
July 6	do	do	do				13.60z
July 27	do	do	do				12.40z
Aug. 15	do	do	do	2.50	3.70	2.92	10.90
Sept. 5	do	do	do				14.00z
Oct. 2	do	do	do				11.10z
Oct. 26	do	do	do				2.10z
Nov. 17	do	do	do				2.40z
July 22	do	Spencer creek	SE. 18-26-5-5	19.0	11.20	1.44	16.20
Aug. 8	do	do	do	19.5	10.00	1.32	13.20
Sept. 22	do	do	do	20.8	12.54	1.60	20.00

z Weir measurement.

LITTLE BOW RIVER DRAINAGE BASIN

General Description

The source of Little Bow river is a spring in the town of High River in Section 6, Township 19, Range 28, West of the 4th Meridian. From here it flows in a southeasterly direction for one hundred miles and empties into the Oldman river. In the first few miles the natural flow is dependent entirely on a number of small springs and coulees which are dry most of the year, but later is augmented by the flow from Mosquito creek, which drains the south and westerly part of the drainage basin.

There is a comparatively large flow in this stream during the spring freshets, but during summer it would under natural conditions dry up. There is a large number of ranchers and settlers on this stream and it is very important that there should be a good flow for domestic and stock watering purposes. For this reason, the Provincial Government has constructed a canal and diverts water from Highwood river into Little Bow river whenever required.

MOSQUITO CREEK NEAR NANTON

Location.—On the NE. $\frac{1}{4}$ Sec. 30, Tp. 16, Rge. 28, W. 4th Mer., about four miles from Nanton.

Records available.—August 1, 1908, to October 31, 1915. Discharge measurements only 1906-1908.

Gauge.—Vertical staff; elevation of zero maintained at 89.22 feet during 1908-1912, and at 89.47 feet during 1913-16.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Liable to shift.

Discharge measurements.—Made with current-meter from the bridge at flood stages; by wading during low water.

Winter flow.—Station not maintained during the winter.

Observer.—Wm. Monkman.

DISCHARGE MEASUREMENTS of Mosquito creek near Nanton, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 31.....	J. M. Paul.....	25	18.9	2.63	3.07	50 _g
May 2.....	W. M. Edwards.....	27	20.6	2.30	2.67	47
May 23.....	do.....	27	18.2	1.86	2.55	34
June 20.....	do.....	49	50.8	2.29	3.05	116
July 22.....	do.....	40	50.1	1.18	2.90	59
Aug. 21.....	do.....	48	53.7	1.88	3.08	101
Sept. 19.....	do.....	50	48.2	1.50	2.83	72
Oct. 28.....	do.....	47	44.9	1.64	2.85	74

g Ice going out.

DAILY GAUGE HEIGHT AND DISCHARGE of Mosquito creek near Nanton, for 1916

DAY	April		May		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	3.70	294	2.67	47	4.23	467	3.45	208
2.....	3.60	263	2.45	26	4.20	449	3.55	239
3.....	3.45	220	2.50	29	4.26	467	3.40	193
4.....	3.30	178	2.42	23	4.20	449	3.28	157
5.....	3.25	164	2.45	25	4.15	434	3.15	120
6.....	3.20	151	2.43	23	3.70	294	3.00	81
7.....	3.10	128	2.40	21	3.45	220	3.01	84
8.....	3.05	116	2.42	23	3.35	192	2.98	77
9.....	3.05	116	2.40	21	3.23	159	2.95	70
10.....	2.90	84	2.42	23	3.38	200	2.95	70
11.....	2.80	66	2.43	23	3.31	181	2.90	59
12.....	2.75	58	2.42	23	3.25	164	2.87	54
13.....	2.75	58	2.40	21	3.20	151	2.85	50
14.....	2.70	51	2.42	23	3.15	140	2.84	49
15.....	2.72	54	2.45	25	3.11	130	2.80	42
16.....	2.70	51	2.48	27	3.12	133	2.83	47
17.....	2.65	45	2.50	29	3.10	128	3.00	81
18.....	2.60	39	2.48	27	3.07	121	3.02	86
19.....	2.55	34	2.45	25	3.00	105	3.00	81
20.....	2.50	29	2.45	25	3.05	116	2.95	70
21.....	2.45	25	2.45	25	3.04	114	2.91	61
22.....	2.45	25	2.52	31	3.07	121	2.90	59
23.....	2.40	21	2.74	57	3.02	110	2.90	59
24.....	2.38	20	2.79	64	3.00	105	2.90	59
25.....	2.35	18	2.95	94	2.92	88	2.92	63
26.....	2.34	17	3.00	105	3.20	151	3.23	143
27.....	2.37	19	2.90	84	3.30	178	3.05	94
28.....	2.41	22	2.93	90	4.10	418	2.92	63
29.....	2.48	27	3.79	322	3.80	321	2.88	56
30.....	2.62	41	4.65	588	3.40	193	2.85	50
31.....			4.30	480			2.84	49

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Mosquito creek near Nanton, for 1916.—*Concluded.*

DAY	August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	2.83	47	2.65	24	2.93	90
2.....	2.83	47	2.66	25	2.94	92
3.....	2.82	45	4.10	420	2.93	90
4.....	2.83	47	5.40	849	2.93	90
5.....	2.84	49	4.70	604	3.05	116
6.....	2.83	47	4.64	585	3.08	123
7.....	2.80	42	3.65	278	3.10	128
8.....	2.79	41	3.05	116	3.07	121
9.....		41 ^e	2.98	101	3.00	105
10.....		41 ^e	2.94	92	2.94	92
11.....		41 ^e	2.89	82	2.90	84
12.....	2.80	42	2.90	84	2.88	80
13.....	2.78	39	2.94	92	2.86	77
14.....	2.74	34	2.90	84	2.78	63
15.....	2.70	29	2.90	84	2.75	58
16.....	2.66	25	2.87	79	2.72	54
17.....		208 ^e	2.87	79	2.86	77
18.....		391 ^e	2.87	79	2.90	84
19.....	4.57	575	2.83	71	2.93	90
20.....	3.44	205	2.81	68	3.00	105
21.....	3.24	146	2.80	66	3.05	116
22.....	3.15	120	2.80	66	3.00	105
23.....	3.03	88	2.82	70	2.97	99
24.....	2.92	63	2.80	66	2.96	97
25.....	2.85	50	2.80	66	2.94	92
26.....	2.77	38	2.80	66	2.92	88
27.....	2.71	30	2.78	63	2.91	86
28.....	2.68	27	2.79	64	2.85	75
29.....	2.66	25	2.81	68	2.83	71
30.....	2.65	24	2.85	75	2.80	66
31.....	2.65	24			2.79	64

^e Discharge estimated.

MONTHLY DISCHARGE of Mosquito creek near Nanton, for 1916

(Drainage area 186 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-ft.
April.....	294	17	81	0.435	0.48	4,820
May.....	588	21	79	0.425	0.49	4,858
June.....	467	88	217	1.170	1.30	12,912
July.....	239	42	86	0.462	0.53	5,288
August.....	575	24	86	0.462	0.53	5,288
September.....	849	24	152	0.817	0.91	9,045
October.....	128	54	90	0.484	0.56	5,534
The period.....					4.80	47,745

MEAN MONTHLY DISCHARGE in Second-feet of Mosquito creek near Nanton

MONTH	1907-8	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		25.0	7.0	1.72	5.0	14.3	7.30	7.9	36	90	22	1,324
November.....					8.3a	14.8c						
December.....												
January.....												
February.....												
March.....								119.0e				
April.....			18.6	7.10		26.0d	44.00	5.1	81		31	1,847
May.....		150.0	5.4	8.20		19.3	10.60	74.0	79		50	3,042
June.....		34.0	1.32	2.20	20.0b	31.0	2.90	257.0	217		78	4,639
July.....		41.0	0.01	2.80	31.0	36.0	0.50	228.0	86		53	3,272
August.....	44	9.4	nil	8.80	27.0	31.0	nil	105.0	86		35	2,126
September.....	26	5.9	1.76	6.30	21.0	7.0	nil	45.0	152		29	1,752
Total in Acre-feet.....	4,233	16,225	2,051	2,254	6,440	9,472	3,891	47,800	44,425			18,002

a 1-15.

b 4-30.

c 1-15.

d 20-30

e 15-31.

NANTON CREEK NEAR NANTON

Location.—On the SE. $\frac{1}{4}$ Sec. 19, Tp. 16, Rge. 28, W. 4th Mer., at highway bridge.

Records available.—August 3, 1908, to October 31, 1916.

Gauge.—Vertical staff. Zero of gauge maintained at 82.18 feet during 1908-11; zero of gauge maintained at 82.57 feet during 1912; zero of gauge maintained at 93.33 feet during 1913; zero of gauge maintained at 92.31 feet during 1914-16.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Not liable to shift.

Discharge measurements.—Made with current-meter by wading above gauge.

Observer.—W. Monkman.

DISCHARGE MEASUREMENTS of Nanton creek near Nanton, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 31.....	J. M. Paul.....	9.0	6.60	0.86	2.95	5.7
May 2.....	W. M. Edwards.....	13.0	10.60	0.99	2.38	10.5
May 23.....	do.....	15.0	13.60	0.98	2.54	13.2
June 20.....	do.....	19.0	30.70	1.48	3.50	45.4
July 22.....	do.....	13.5	12.70	1.29	2.49	16.3
Aug. 21.....	do.....	16.0	23.90	1.14	2.80	27.0
Sept. 19.....	do.....	18.0	23.30	1.33	3.05	31.0
Oct. 28.....	do.....	17.0	20.00	1.15	2.86	23.0

SESSIONAL PAPER No. 25a

DAILY GAUGE HEIGHT AND DISCHARGE of Nanton creek near Nanton, for 1916

DAY	May		June		July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	2.60	15.6	5.50	118	3.20	37.0	2.34	12.8	2.36	12.6	3.10	32.0
2....	2.34	9.8	5.05	101	3.45	46.0	2.34	12.8	2.38	12.9	3.23	36.0
3....	2.20	7.7	4.60	85	3.35	43.0	2.34	12.9	4.60	89.0	3.15	33.0
4....	2.10	6.4	4.40	78	3.28	41.0	2.33	12.8	.....	87.0e	3.21	35.0
5....	2.07	6.0	5.80	128	3.04	32.0	2.40	14.5	4.50	85.0	3.13	32.0
6....	2.05	5.8	4.70	89	2.89	27.0	2.35	13.3	4.10	70.0	3.54	47.0
7....	2.02	5.5	4.44	79	2.85	26.0	2.33	12.8	3.50	49.0	3.27	37.0
8....	2.00	5.3	4.23	72	2.80	25.0	2.32	12.6	3.50	49.0	3.15	33.0
9....	2.01	5.4	4.15	69	2.78	24.0	.....	12.6e	3.45	47.0	3.00	28.0
10....	2.00	5.3	4.34	76	2.75	23.0	.....	12.9e	3.37	44.0	2.96	27.0
11....	2.01	5.4	4.05	65	2.70	22.0	.....	13.2e	3.30	41.0	2.93	26.0
12....	2.01	5.4	3.95	62	2.65	20.0	2.35	13.4	3.35	43.0	2.90	25.0
13....	2.03	5.6	3.92	61	2.68	22.0	2.33	12.9	3.65	53.0	2.86	24.0
14....	2.05	5.8	3.80	56	2.60	19.2	2.21	10.4	3.65	53.0	2.83	23.0
15....	2.05	5.8	3.73	54	2.58	18.6	2.15	9.4	3.50	47.0	2.80	22.0
16....	2.08	6.2	3.66	51	2.56	18.2	2.12	8.9	3.34	41.0	2.79	21.0
17....	2.08	6.2	3.45	44	2.60	19.4	.....	100.0e	3.20	36.0	2.87	24.0
18....	2.05	5.8	3.38	41	2.56	18.2	7.40x	192.0	3.09	33.0	3.00	28.0
19....	2.02	5.5	3.35	40	2.54	17.8	4.67	93.0	3.05	31.0s	3.05	30.0
20....	2.05	5.8	3.50	45	2.53	17.6	3.45	50.0	3.01	28.0	3.10	32.0
21....	2.04	5.7	3.44	43s	2.50	16.6	3.20	41.0	3.00	28.0	3.35	40.0
22....	2.55	14.4	3.37	41	2.49	16.3	3.01	34.0	3.00	28.0	3.20	35.0
23....	3.10	32.0	3.25	37	2.47	16.0	2.90	30.0	3.00	28.0	3.09	31.0
24....	3.34	40.0	3.19	35	2.44	15.2	2.70	23.0	2.99	28.0	3.00	28.0
25....	3.15	33.0	3.18	35	2.46	15.8	2.59	19.7	2.98	27.0	2.95	26.0
26....	3.25	37.0	3.40	43	3.25	10.8	2.40	14.4	2.98	27.0	2.93	26.0
27....	3.15	33.0	3.55	49	2.75	25.0	2.35	12.7	2.95	26.0	2.91	25.0
28....	4.15	69.0	4.85	96	2.60	20.0	2.35	12.7	2.91	25.0	2.75	20.0
29....	5.05	101.0	3.65	53	2.44	15.3	2.35	12.6	2.86	24.0	2.50	13.1
30....	6.30	146.0	3.38	43	2.40	14.2	2.36	12.9	2.91	25.0	2.70	18.5
31....	4.90	96.0	.....	.....	2.38	13.8	2.36	12.5	.....	.....	2.63	16.4

e Discharge estimated.

x Maximum flood peak.

s - s Shifting conditions.

MONTHLY DISCHARGE of Nanton creek near Nanton, for 1916

(Drainage area 46 square miles)

MONTH	DISCHARGE IN SECOND-Feet				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
May.....	146	5.3	24	0.522	0.60	1,476
June.....	128	35.0	63	1.370	1.53	3,749
July.....	46	10.8	22	0.478	0.55	1,353
August.....	192	8.9	28	0.609	0.70	1,722
September.....	89	12.6	41	0.891	0.99	2,440
October.....	47	13.1	28	0.609	0.70	1,722
The period.....	.....	.....	.....	.....	5.07	12,462

MEAN MONTHLY DISCHARGE in Second-feet of Nanton creek near Nanton

MONTH	1907-8	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		9.8	2.50	0.18	8.10	7.40 _c	4.10	4.10	12.6	28.0	8.6	528
November.....						8.80 _g						
December.....												
January.....												
February.....												
March.....								34.0 _i				
April.....		2.40	0.63	3.90 _d		12.90	2.5				4.6	275
May.....	40.0	2.10	2.70	3.20		3.10	18.5	24.0			13.4	824
June.....	19.9	0.19	2.70	4.40 _e		0.64	59.0	63.0			24.0	1,442
July.....		16.2	2.10				0.63	68.0	22.0		22.0	1,339
August.....	13.2 _a	3.9	9.60	8.90 _f		0.14	30.0	28.0			14.3	882
September.....	8.2	1.9	1.66 _b	5.90	12.80	3.20 _h	0.02	16.4	41.0		12.3	733
Total in Acre-feet....	1,246	5,602	529	1,446	2,518	891	1,299	13,198	11,515			6,023

a 3-31.
b 5-30.
c 1-15.
d 13-30.
e 1-27.
f 6-31.
g 1-15.
h 8-30.
i 15-31.

OLDMAN RIVER DRAINAGE BASIN

General Description

The Oldman river is the largest of the two streams which, on their junction, form the South Saskatchewan river.

The main river is formed between the Rocky mountains and Livingstone range by the junction of Livingstone river, Northwest Branch, West Branch and Race Horse creek. It first flows southeasterly until joined by the Crownsnest and Castle rivers and then flows in a general easterly direction to its junction with the Bow river. There are a number of small tributaries joining the main stream and two large ones, the Belly river and the St. Mary river. These two streams empty into the river between Macleod and Lethbridge, and full descriptions of their basins are given elsewhere in this report.

The territory drained by this stream consists of mountains, foot-hills and prairie. The mountain region is quite extensive and is divided into the main range and the Livingstone range of the Rocky mountains. There is a good forest cover on many parts of the mountains and foot-hills, but much of the Livingstone range and some parts of the Rockies are precipitous and bare of tree growth. On the higher peaks considerable amount of snow collects and thus the streams are subject to high water caused by melting snows during the heat of the summer and in the early spring.

The precipitation throughout this basin varies greatly. It is heaviest in the mountains and decreases rapidly towards the eastern edge of the basin, where it is rather small. There are no irrigation projects of any size on the main river, although extensive surveys have been carried on with the object of irrigating a large area lying between the main river and the Little Bow river, water to be diverted west of Macleod. On the small tributaries a number of irrigation schemes are now in operation.

A special report upon the floods in this drainage basin was published in an Appendix to the 1915 report.

ALLISON CREEK NEAR SENTINEL

Location.—On the SW. $\frac{1}{4}$ Sec. 11, Tp. 8, Rge. 5, W. 5th Mer.

Records available.—Discharge measurements during 1914, 1915 and 1916.

Gauge.—Plain staff, graduated to hundredths; zero maintained at elevation 93.64 feet.

Bench-mark.—On stump of spruce tree, on left bank of creek; assumed elevation 100.00 feet.

Channel.—Not liable to shift.

Discharge measurements.—Made with current-meter by wading, twenty feet above gauge.

Winter flow.—Station not maintained during winter.

Observer.—None.

SESSIONAL PAPER No. 25a

DISCHARGE MEASUREMENTS of Allison creek near Sentinel, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 23.	J. M. Paul.	12.0	6.60	1.29	1.50	8.5
April 14.	do	12.0	7.40	1.38	1.56	10.2
May 8.	W. M. Edwards.	13.0	10.10	2.50	1.80	25.0
June 6.	do	14.0	12.80	3.49	2.00	45.0
July 4.	do	15.5	21.20	4.17	2.50	88.0
Aug. 2.	do	14.5	11.40	2.50	1.76	29.0
Aug. 30.	do	14.0	8.40	2.20	1.70	18.4
Nov. 16.	do	14.0	15.00	0.95	1.95	14.2

CROWNSEST RIVER NEAR COLEMAN

Location.—On SW. ¼ Sec. 12, Tp. 8, Rge. 5, W. 5th Mer., near Prudent Le Gal's house.

Records available.—June 13, 1910, to December 31, 1916.

Gauge.—Vertical staff. Zero maintained at elevation of 92.12 feet during 1910-12; zero maintained at elevation of 92.73 feet during 1913-16.

Bench-mark.—Permanent iron bench-mark, located on left bank at the station; assumed elevation 100.00 feet.

Channel.—Composed of gravel and slightly shifting.

Discharge measurements.—Made from a wooden bridge during ordinary and high water, and by wading during low stages at a point about one mile below the gauge.

Winter flow.—Discharge measurements continued during the winter season.

Observer.—Prudent Le Gal.

Remarks.—All measurements were made from wooden bridge during open water in 1916.

DISCHARGE MEASUREMENTS of Crowsnest river near Coleman, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 11.	W. R. McCaffrey.	24.0	29.6	1.01	2.10	30
Jan. 26.	H. W. Rowley.	21.0	26.4	1.10	1.94	29
Feb. 9.	do	22.0	30.6	0.96	1.93	29
Feb. 24.	do	22.0	33.8	1.15	1.48	39
Mar. 13.	do	24.0	35.2	1.34	1.60	47
Mar. 23.	J. M. Paul.	25.0	33.8	1.31	1.60	44
April 14.	do	26.0	39.9	1.83	1.84	73
May 8.	W. M. Edwards.	31.0	67.9	3.63	2.97	247
June 6.	do	31.0	66.4	4.16	3.14	276
June 27.	do	31.0	104.0	5.01	4.40	521
July 4.	do	32.0	102.2	4.82	4.35	492
Aug. 2.	do	28.0	57.8	3.32	2.90	192
Aug. 30.	do	28.0	50.0	2.46	2.44	123
Oct. 16.	E. J. Switzer.	23.7	32.8	1.63	1.87	54
Oct. 16.	do	28.5	37.6	1.55	1.87	59
Nov. 16.	W. M. Edwards.	24.0	25.2	1.08	2.06	26
Dec. 7.	do	23.0	29.3	0.93	2.05	27
Dec. 22.	E. J. Switzer.	25.0	31.5	1.03	1.79	33

DAILY GAUGE HEIGHT AND DISCHARGE of Crownsnest river near Coleman, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	1.78	38	1.49	26	1.83	40	1.60	47	2.14	114	2.54	175
2....	1.81	37	1.40	25	1.93	42	1.61	48	2.15	115	2.59	183
3....	2.73	37	1.53	26	2.13	45	1.61	48	2.25	129	2.49	167
4....	1.90	36	1.49	26	1.97	46	1.58	45	2.50	169	2.79	215
5....	1.94	36	1.52	26	1.70	43	1.65	52	2.70	201	3.09	268
6....	1.93	35	1.39	25	1.78	43	1.64	51	2.80	217	3.09	268
7....	1.78	34	1.51	25	1.63	41	1.65	52	3.00	252	3.20	288
8....	1.76	33	1.74	27	1.95	43	1.65	52	2.99	250	3.20	288
9....	1.53	32	1.75	29	2.79	49	1.75	62	2.94	241	3.71	381
10....	1.73	31	1.80	38	1.65	52	1.79	67	2.74	207	3.66	371
11....	1.98	30	2.04	56	1.69	56	1.81	69	2.55	177	3.56	353
12....	1.83	28	1.85	56	1.69	56	1.83	72	2.52	172	3.47	337
13....	1.67	27	2.09	90	1.60	47	1.85	74	2.44	159	3.59	358
14....	1.58	27	2.72	196	1.56	44	1.87	76	2.39	151	3.73	385
15....	1.45	26	2.95	212	1.56	44	1.93	84	2.29	135	3.99	437
16....	1.46	26	2.68	198	1.54	42	1.92	83	.....	134 ^e	4.69	585
17....	1.46	27	2.02	97	1.55	43	1.92	83	2.27	132	4.70	587
18....	1.49	28	1.69	56	1.55	43	1.88	78	2.30	137	5.05	664
19....	1.49	28	1.60	47	1.60	47	1.89	79	2.33	142	5.29	717
20....	1.62	29	1.56	44	1.66	53	1.88	78	2.45	161	5.06	666
21....	1.80	30	1.55	43	1.65	52	1.88	78	2.53	174	5.32	723
22....	1.86	32	1.52	41	1.60	47	1.86	75	2.59	183	4.99	651
23....	1.92	33	1.55	43	1.60	47	1.84	73	2.61	187	4.58	561
24....	1.91	33	1.48	37	1.63	50	1.84	73	2.54	175	4.48	539
25....	2.10	34	1.46	36	1.62	49	1.89	79	2.46	163	4.49	541
26....	1.85	29	1.41	32	1.63	50	1.93	84	2.45	161	4.49	541
27....	1.50	28	1.44	34	1.65	52	2.00	94	2.42	156	4.41	523
28....	1.70	27	1.44	34	1.60	47	2.14	114	2.42	156	4.60	552
29....	2.05	29	1.49	38	1.60	47	2.15	115	2.54	159	4.55	540
30....	1.75	31	.....	.....	1.59	46	2.15	115	2.59	183	4.36	494
31....	1.55	28	.....	.....	1.60	47	.....	.....	2.57	180	.....	.....

^e Discharge estimated.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Crowsnest river near Coleman, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	4.10	432	2.87	188	2.40	118	1.97	66	1.90	59	1.82	25
2....	4.60	552	2.85	185	2.40	118	1.98	67	1.89	58	1.75	26
3....	4.56	542	2.80	177	2.44	124	1.98	67	1.88	57	1.73	26
4....	4.22	461	2.75	169	2.65	153	1.98	67	1.88	57	1.75	26
5....	4.02	414	2.73	166	2.80	177	1.97	66	1.86	55	1.75	27
6....	4.04	419	2.70	161	2.65	153	1.95	64	1.84	53	1.75	27
7....	3.99	408	2.66	155	2.61	147	1.97	66	1.86	51	2.12	27
8....	4.07	425	2.62	149	2.48	129	1.86	55	1.88	48	2.70	28
9....	4.04	419	2.86	187	2.45	125	1.84	53	1.88	46	1.72	28
10....	4.00	410	2.85	185	2.42	121	1.82	52	1.86	44	1.70	28
11....	3.97	403	2.79	175	2.45	125	1.83	52	1.83	43	2.65	30
12....	3.84	375	2.82	180	2.36	112	1.84	53	2.32	41	1.77	30
13....	3.82	370	2.70	161	2.30	104	1.86	55	2.31	32	1.93	30
14....	3.71	346	2.67	156	2.28	102	1.86	55	2.25	28	1.93	29
15....	3.48	298	2.67	156	2.26	99	1.86	55	1.58	27	1.93	30
16....	3.53	308	2.62	149	2.23	96	1.84	53	2.12	26	1.91	33
17....	3.63	329	2.58	143	2.21	93	1.82	52	2.00	26	1.89	34
18....	3.52	306	2.60	146	2.20	92	1.80	50	1.96	25	1.87	31
19....	3.49	300	2.54	138	2.00	69	1.80	50	1.94	24	1.88	33
20....	3.28	258	2.51	133	1.98	67	1.80	50	1.86	24	1.86	35
21....	3.28	258	2.55	139	2.52	135	1.80	50	1.81	25	1.86	34
22....	3.35	272	2.52	135	2.23	96	1.80	50	1.79	25	1.88	35
23....	3.23	249	2.50	132	2.00	69	1.82	52	1.75	24	1.91	33
24....	3.02	212	2.50	132	1.97	66	1.84	53	1.96	25	1.92	33
25....	3.02	212	2.46	126	2.00	69	1.86	55	1.91	26	1.92	34
26....	3.02	212	2.44	124	2.00	69	1.90	59	1.78	25	1.92	34
27....	3.02	212	2.44	124	2.00	69	1.90	59	1.77	24	1.93	34
28....	2.97	204	2.40	118	1.98	67	1.90	59	1.77	24	2.37	35
29....	2.93	198	2.44	124	1.96	65	1.90	59	1.78	24	2.63	37
30....	2.95	201	2.44	124	1.97	66	1.90	59	1.78	25	2.59	38
31....	2.92	196	2.44	124	.....	.....	1.90	59	.....	.....	2.58	38

MONTHLY DISCHARGE of Crowsnest river near Coleman, for 1916

(Drainage area 70 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	38	26	31	0.443	0.51	1,906
February.....	212	25	57	0.814	0.88	3,279
March.....	56	40	47	0.671	0.77	2,890
April.....	115	45	73	1.040	1.16	4,344
May.....	252	114	170	2.430	2.80	10,453
June.....	723	167	445	6.360	7.10	26,479
July.....	552	196	329	4.700	5.42	20,229
August.....	188	118	150	2.140	2.47	9,223
September.....	177	65	103	1.470	1.64	6,129
October.....	67	50	57	0.814	0.94	3,505
November.....	59	24	36	0.514	0.57	2,142
December.....	38	25	31	0.443	0.51	1,906
The year.....	.....	.....	.....	.....	24.77	92,485

MEAN MONTHLY DISCHARGE in Second-feet of Crowsnest river near Coleman

MONTH	1900-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec-ft.	Mean in Acre-ft.
October.....		118	69	57	88	129	70	57	84	5,432
November.....		84 ^b	88	62	71	98	63	36	70	4,154
December.....			34	41	60	59	46	31	45	2,771
January.....			37	28	42	44	31		36	2,238
February.....			32	24	33	33	57		36	2,021
March.....		41	30	25	44	38	47		38	2,258
April.....		62	47	65	102	76	73		71	4,221
May.....		253	128	158	284	239	170		205	12,626
June.....		477	186	329	261	256	445		326	19,378
July.....	128 ^a	232	190	191	202	214	329		226	13,916
August.....	96	143	98	150	109	126	150		125	7,661
September.....	92	154	71	95	88	71	103		96	5,731
Total in Acre-feet..	12,410	89,030	61,222	74,140	83,855	85,645	95,813			82,407

^a 28-31.^b 1-5.

MCGILLIVRAY CREEK NEAR COLEMAN

Location.—On SE. $\frac{1}{4}$ of Sec. 7, Tp. 8, Rge. 4, W. 4th Mer., about 150 feet north of the Canadian Pacific Railway Company's culvert across the creek.

Records available.—January 9, 1913, to June 15, 1915, and discharge measurements only in 1916.

Gauge.—Vertical staff; zero elevation 97.01 feet.

Bench-mark.—Stump on left bank about fifty feet down stream from the gauge; assumed elevation 100.00 feet.

Channel.—Gravel and slightly shifting.

Discharge measurements.—Made with a current-meter by wading during low stages and from a foot-bridge, during high water.

Winter flow.—Discharge measurements only made during the winter season.

Observer.—None engaged during 1916.

DISCHARGE MEASUREMENTS of McGillivray creek near Coleman, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 26.....	H. W. Rowley.....	9.0	4.90	0.45	1.12	2.20
Feb. 24.....	do.....	12.0	6.00	0.50	1.11	3.00
Mar. 13.....	do.....	14.0	7.90	0.72	1.18	6.70
Mar. 23.....	J. M. Paul.....	14.0	7.40	0.72	1.24	5.30
April 14.....	do.....	18.0	10.60	1.50	1.46	15.90
May 8.....	W. M. Edwards.....	23.0	26.20	2.59	2.12	68.00
June 6.....	do.....	24.0	25.30	2.19	2.12	55.00
July 4.....	do.....	21.0	25.30	2.76	2.20	70.00
Aug. 2.....	do.....	19.0	9.75	1.02	1.46	9.90
Aug. 30.....	do.....	18.0	6.80	0.84	1.35	5.70
Oct. 16.....	E. J. Switzer.....	10.8	8.73	0.37	1.32	3.20
Nov. 16.....	W. M. Edwards.....	8.0	6.15	0.50	1.30	3.10
Dec. 7.....	do.....	9.5	6.88	0.29		2.00
Dec. 22.....	do.....	10.0	6.20	0.18		1.11

SESSIONAL PAPER No. 25b

CROWSNEST RIVER NEAR FRANK

Location.—On the NE. $\frac{1}{4}$ Sec. 36, Tp. 7, Rge. 4, W. 5th Mer., at the traffic bridge.

Records available.—June 13, 1910, to December 31, 1916.

Gauge.—Vertical staff. Altered to box chain gauge, August 1, 1916, located on the traffic bridge; zero elevation 90.57.

Bench-mark.—A stump on the left bank about twenty-four feet from the new chain gauge; assumed elevation of bench-mark 100.00 feet.

Channel.—Gravel and fairly permanent.

Discharge measurements.—Made from traffic bridge during high water and by wading in low stages.

Winter flow.—Discharge measurements are continued during the winter season.

Observer.—I. Wilson.

DISCHARGE MEASUREMENTS of Crowsnest river near Frank, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 12.....	W. R. McCaffrey.....	50.0	45.0	1.42	4.12	64
Jan. 27.....	H. W. Rowley.....	48.0	36.4	1.30	4.06	48
Feb. 8.....	do.....	46.0	31.6	1.30	3.97	41
Feb. 25.....	do.....	51.0	49.6	1.61	4.28	80
Mar. 14.....	do.....	55.0	59.0	1.85	4.46	109
Mar. 24.....	J. M. Paul.....	55.0	64.5	1.95	4.54	126
April 15.....	do.....	70.0	122.0	3.23	5.25	394
May 9.....	W. M. Edwards.....	73.0	147.4	3.92	5.76	578
June 5.....	do.....	73.0	165.4	4.24	6.10	701
June 27.....	do.....	73.0	179.0	4.84	6.28	867
July 4.....	do.....	73.0	190.9	5.05	6.43	964
Aug. 1.....	do.....	68.0	92.6	2.68	5.17	248
Aug. 29.....	do.....	68.0	60.2	2.24	4.54	135
Oct. 17.....	E. J. Switzer.....	67.4	56.0	1.42	4.54	80
Nov. 17.....	W. M. Edwards.....	54.0	41.3	1.30	4.32	54
Dec. 6.....	do.....	55.0	43.5	1.25	4.36	54
Dec. 21.....	E. J. Switzer.....	52.0	38.2	1.21	4.28	46

DAILY GAUGE HEIGHT AND DISCHARGE OF Crowsnest river near Frank, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	4.05	50	4.02	47	4.15	62	4.45	138	5.30	374	5.40	351
2.....	4.05	50	4.00	45	4.15	62	4.45	139	5.65	544	5.40	348
3.....	4.06	51	4.00	45	4.15	62	4.45	140	6.30	908	5.55	413
4.....	4.06	51	3.98	43	4.15	62	4.45	141	6.50	1,030	5.65	460
5.....	4.07	52	3.98	43	4.15	62	4.45	142	6.35	929	6.00	646
6.....	4.09	55	3.97	42	4.15	62	4.55	167	6.65	1,112	5.95	621
7.....	4.10	56	3.97	42	4.14	61	4.67	198	6.40	954	5.95	623
8.....	4.12	58	3.93	38	4.15	62	4.85	250	6.10	768	6.05	681
9.....	4.12	58	3.97	42	4.18	66	4.90	265	5.80	598	6.15	739
10.....	4.12	58	3.97	42	4.35	91	5.05	319	5.50	439	6.20	771
11.....	4.10	56	3.97	42	4.55	129	5.00	300	5.40	391	6.10	715
12.....	4.10	56	3.97	42	4.62	144	4.97	288	5.30	345	6.05	689
13.....	4.10	56	3.98	43	4.55	129	5.00	297	5.26	328	6.10	722
14.....	4.10	56	4.00	45	4.51	121	5.40	469	5.25	321	6.20	783
15.....	4.10	56	4.04	49	4.45	109	5.25	394	5.25	320	6.50	967
16.....	4.10	56	4.45	109	4.40	100	5.00	292	5.25	319	6.90	1,216
17.....	4.10	56	4.40	100	4.38	96	4.97	279	5.25	317	7.20	1,403
18.....	4.09	55	4.40	100	4.42	104	4.95	270	5.40	377	7.35	1,503
19.....	4.09	55	4.35	91	4.43	105	4.93	263	5.47	404	7.50	1,594
20.....	4.08	54	4.30	83	4.52	123	4.90	251	5.55	442	7.63	1,684
21.....	4.08	54	4.28	80	4.60	140	4.90	250	5.50	418	7.31	1,487
22.....	4.07	52	4.28	80	4.56	131	4.90	249	5.45	390	6.83	1,194
23.....	4.20	69	4.28	80	4.54	127	4.90	247	5.40	370	6.42	941
24.....	.....	60e	4.26	77	4.52	123	4.90	244	5.35	345	6.38	920
25.....	4.05	50	4.25	76	4.50	125	5.20	349	5.28	314	6.33	892
26.....	4.05	50	4.25	76	4.45	119	5.65	568	5.30	321	6.33	888
27.....	4.04	49	4.24	75	4.45	123	5.85	670	5.35	341	6.28	859
28.....	4.04	49	4.20	69	4.45	127	5.60	532	5.60	450	6.55	1,036
29.....	4.04	49	4.16	63	4.44	128	5.40	425	5.55	424	6.60	1,067
30.....	4.04	49	.....	.....	4.43	128	5.35	399	5.53	410	6.35	912
31.....	4.02	47	.....	.....	4.42	128	.....	.....	5.45	376	.....	.....

e Discharge estimated.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Crowsnest river near Frank, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	6.40	943	5.07	212	4.80	132	4.61	93	4.47	70	4.37	56
2....	6.53	1,024	5.06	208	4.80	132	4.60	91	4.47	70	4.37	56
3....	6.60	1,067	5.05	205	4.95	172	4.60	91	4.48	71	4.37	56
4....	6.33	900	5.05	205	5.00	188	4.60	91	4.48	71	4.37	56
5....	6.15	788	5.03	198	4.98	182	4.60	91	4.48	71	4.37	56
6....	6.05	726	5.02	195	4.94	169	4.60	91	4.47	70	4.36	55
7....	6.00	696	5.00	188	4.88	153	4.60	91	4.45	67	4.35	54
8....	6.00	696	5.00	188	4.84	142	4.59	89	4.43	64	4.30	48
9....	5.95	666	5.20	260	4.83	140	4.58	87	4.45	67	4.28	46
10....	5.90	636	5.13	233	4.80	132	4.57	86	4.43	64	4.28	46
11....	5.85	606	5.08	215	4.78	127	4.57	86	4.43	64	4.26	44
12....	5.78	564	5.08	215	4.75	120	4.56	84	4.33	52	4.25	43
13....	5.73	534	5.05	205	4.74	118	4.56	84	4.28	46	4.25	43
14....	5.68	504	5.03	198	4.74	118	4.56	84	4.23	41	4.25	43
15....	5.60	458	5.00	188	4.73	116	4.56	84	4.26	44	4.25	43
16....	5.60	458	4.97	178	4.72	113	4.56	84	4.28	46	4.25	43
17....	5.60	458	4.95	172	4.71	111	4.51	76	4.40	60	4.28	46
18....	5.58	447	5.00	188	4.70	109	4.51	76	4.35	54	4.28	46
19....	5.50	403	4.95	172	4.68	105	4.50	74	4.35	54	4.30	48
20....	5.43	367	4.93	166	4.68	105	4.49	73	4.35	54	4.30	48
21....	5.40	352	4.90	158	4.67	104	4.48	71	4.35	54	4.30	48
22....	5.38	342	4.88	153	4.65	100	4.48	71	4.35	54	4.30	48
23....	5.33	317	4.85	145	4.65	100	4.48	71	4.33	54	4.30	48
24....	5.30	303	4.85	145	4.65	100	4.47	70	4.35	54	4.28	46
25....	5.27	289	4.85	145	4.64	98	4.47	70	4.35	54	4.28	46
26....	5.23	272	4.85	145	4.64	98	4.47	70	4.35	54	4.26	44
27....	5.30	303	4.85	145	4.63	96	4.50	74	4.36	55	4.26	44
28....	5.29	298	4.83	140	4.62	95	4.48	71	4.37	56	4.26	44
29....	5.28	294	4.82	137	4.62	95	4.48	71	4.37	56	4.25	43
30....	5.23	272	4.82	137	4.61	93	4.47	70	4.37	56	4.25	43
31....	5.17	248	4.81	135	.....	.....	4.47	70	.....	.....	4.26	44

MONTHLY DISCHARGE of Crowsnest river near Frank, for 1916

(Drainage area 168 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	69	47	54	0.321	0.37	3,320
February.....	109	38	62	0.369	0.40	3,566
March.....	144	61	104	0.619	0.71	6,395
April.....	670	138	298	1.770	1.98	17,732
May.....	1,112	314	496	2.950	3.41	30,498
June.....	1,684	348	904	5.380	6.00	53,792
July.....	1,067	248	524	3.120	3.60	32,220
August.....	260	135	180	1.070	1.23	11,068
September.....	188	93	122	0.726	0.81	7,260
October.....	93	70	80	0.476	0.55	4,919
November.....	71	41	58	0.345	0.38	3,451
December.....	56	43	48	0.286	0.33	2,951
The year.....	.....	.....	.....	.....	19.77	177,172

MEAN MONTHLY DISCHARGE in Second-feet of Crowsnest river near Frank

MONTH	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		210	136	75	110	219	104	80	133	8 203
November			68	76	85	170	82	58	90	5,346
December			63	54	51	98	54	48	61	3,776
January		50	46	52	64	67	54		56	3,422
February		46	41	41	49	53	62		42	2,740
March		58	37	36	52	52	104		56	3,474
April		224	194	253	238	235	298		240	14,304
May		642	392	469	484	559	496		507	31,177
June		855	370	577	392	450	904		591	35,190
July	134 ^a	297	360	261	236	332	524		335	20,598
August	109	220	157	178	140	173	180		165	10,160
September	112	306	96	120	124	95	122		139	8,286
Total in acre-feet..	14,163	175,833	118,939	132,489	122,620	151,704	180,445			146,676

^a 29-31

CROWSNEST RIVER NEAR LUNDBRECK

Location.—On the NE. $\frac{1}{2}$ Sec. 26, Tp. 7, Rge. 2, W. 5th Mer., at the traffic bridge just north of Lundbreck.

Records available.—September 7, 1907, to December 31, 1916.

Gauge.—Chain, on downstream side of the traffic bridge. Elevation at zero of staff gauge maintained at 91.82 feet during 1912-13. Elevation at zero of chain gauge maintained at 90.86 feet during 1914-15-16.

Bench-mark.—Permanent bench-mark cut in the left wing-wall on the downstream side; assumed elevation 100.00 feet.

Channel.—Rocky formation and fairly permanent.

Discharge measurements.—Made from the traffic bridge.

Winter flow.—Records are obtained throughout the frozen period.

Observer.—Ed. Marlow.

DISCHARGE MEASUREMENTS of Crowsnest river near Lundbreck, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 13	W. R. McCaffrey	52.0	43.6	1.34	3.12	59
Jan. 29	H. W. Rowley	41.0	46.8	1.62	3.26	76
Feb. 14	do	40.0	44.8	1.64	3.15	73
Feb. 19	J. E. Caughey				3.95	269 ^x
Feb. 26	H. W. Rowley	87.0	77.3	1.74	3.25	134
Mar. 21	J. M. Paul	60.0	114.0	2.43	2.42	277
April 11	do	66.0	143.0	3.20	2.92	457
May 11	W. M. Edwards	68.0	170.7	3.94	3.28	673
June 7	do	69.0	198.2	4.79	3.70	949
June 22	W. H. Hannan	76.0	304.2	5.78	5.06	1,758
June 23	do	72.0	236.6	5.79	4.35	1,370
June 24	do	71.0	198.3	5.27	3.95	1,045
June 26	do	72.0	207.5	5.43	4.05	1,126
June 29	do	72.0	230.0	5.86	4.35	1,346
June 30	do	72.0	226.9	5.68	4.12	1,288
July 6	W. M. Edwards	69.0	197.2	4.88	3.80	963
Aug. 9	do	63.0	120.8	3.12	2.67	376
Sept. 7	do	59.0	102.2	2.31	2.31	236
Oct. 18	E. J. Switzer	55.6	79.9	1.84	1.91	147
Nov. 21	W. M. Edwards	63.0	96.1	1.02	2.96	98
Dec. 8	do	65.0	56.8	0.80	2.16	46
Dec. 27	E. J. Switzer	65.0	84.3	0.77	3.00	65

^x Water running over and under ice.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Crowsnest river near Lundbreck, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	2.42	52	3.27	77	4.66	295	2.20	209	3.18	620	3.30	681
2....	2.67	52	3.17	78	4.86	288	2.21	212	3.27	665	3.25	655
3....	2.77	52	3.19	78	4.66	282	2.24	219	3.42	746	3.20	630
4....	2.82	52	3.17	76	4.89	283	2.22	214	3.92	1,040	3.40	735
5....	2.82	52	3.17	74	4.34	276	2.19	207	3.99	1,086	3.85	995
6....	2.82	52	3.19	72	4.61	272	2.24	219	3.91	1,034	3.75	934
7....	2.85	53	3.21	72	4.16	266	2.39	266	4.21	1,241	3.60	846
8....	2.87	54	3.22	71	4.39	267	2.54	320	3.90	1,027	3.65	875
9....	2.97	54	3.27	72	4.40	261	2.64	364	3.40	735	3.95	1,060
10....	2.97	56	3.32	72	2.34	249	2.74	408	3.28	671	3.97	1,073
11....	2.92	57	3.32	72	2.56	328	2.79	430	3.28	671	3.95	1,060
12....	2.92	59	3.17	70	2.59	342	2.74	408	3.10	580	3.70	904
13....	3.13	59	3.07	71	2.34	249	2.79	430	3.10	580	3.75	934
14....	3.13	59	3.47	73	2.29	234	2.88	472	3.10	580	3.75	934
15....	3.07	58	5.14	180	2.24	219	2.98	520	3.06	560	3.98	1,080
16....	3.07	58	5.39	293	2.19	207	2.83	449	3.04	550	4.20	1,234
17....	3.07	59	4.34	280	2.14	195	2.82	444	3.00	530	4.30	1,308
18....	3.02	62	4.09	273	2.14	195	2.72	399	3.05	555	4.40	1,382
19....	3.07	66	3.94	269	2.19	207	2.67	377	3.20	630	4.58	1,515
20....	3.07	69	3.59	254	2.39	266	2.71	394	3.35	708	4.70	1,604
21....	2.97	68	3.54	234	2.44	283	2.66	372	3.40	735	4.95	1,789
22....	2.97	66	3.39	214	2.34	249	2.61	350	3.18	620	5.06	1,870
23....	2.87	64	3.29	194	2.29	234	2.59	342	3.12	590	4.35	1,345
24....	2.77	64	3.34	171	2.29	234	2.60	346	3.08	570	3.95	1,060
25....	2.87	67	3.44	153	2.29	234	2.65	368	3.10	580	3.95	1,060
26....	2.97	70	3.24	134	2.26	225	2.94	500	3.04	550	4.05	1,127
27....	3.22	73	3.29	135	2.24	219	3.34	703	3.05	555	3.94	1,053
28....	3.22	75	3.29	137	2.19	207	3.74	928	3.45	762	4.25	1,271
29....	3.27	76	5.44	214	2.19	207	3.33	697	3.45	762	4.35	1,345
30....	3.29	76	.....	.....	2.14	195	3.03	545	3.45	762	4.05	1,127
31....	3.29	77	.....	.....	2.19	207	.....	.....	3.45	762	.....	.....

DAILY GAUGE HEIGHT AND DISCHARGE OF Crowsnest river near Lundbreck, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	3.90	1,027	2.55	324	2.20	209	1.96	156	1.86	137	2.80	71
2....	4.30	1,308	2.50	304	2.18	204	1.95	154	1.85	135	2.50	74
3....	4.18	1,220	2.50	304	2.20	209	1.95	154	1.84	133	2.50	75
4....	4.05	1,127	2.48	297	2.33	246	1.95	154	1.86	137	2.45	73
5....	3.95	1,060	2.48	297	2.35	252	1.95	154	1.88	140	2.50	68
6....	3.80	964	2.45	286	2.35	252	1.95	154	1.88	140	2.55	57
7....	3.65	875	2.38	262	2.31	240	1.95	154	1.87	139	2.25	50
8....	3.60	846	2.38	262	2.28	231	1.90	144	1.89	142	2.30	46
9....	3.50	790	2.67	377	2.23	217	1.90	144	1.90	144	2.30	45
10....	3.48	779	2.65	368	2.19	207	1.90	144	1.80	126	2.35	45
11....	3.45	762	2.58	337	2.15	197	1.90	144	1.75	117	2.40	47
12....	3.40	735	2.50	304	2.12	190	1.90	144	2.70	98	2.55	48
13....	3.30	681	2.48	297	2.15	197	1.88	140	2.87	97	2.58	47
14....	3.20	630	2.46	290	2.10	185	1.90	144	2.85	103	2.58	45
15....	3.15	605	2.40	269	2.10	185	1.90	144	2.30	100	2.56	44
16....	3.10	580	2.40	269	2.11	187	1.88	140	2.22	98	2.57	44
17....	3.10	580	2.44	283	2.09	183	1.90	144	3.23	100	2.55	48
18....	3.05	555	2.48	297	2.08	181	1.90	144	3.16	102	2.70	46
19....	3.00	530	2.40	269	2.06	176	1.88	140	3.00	100	2.75	49
20....	2.98	520	2.38	262	2.05	174	1.90	144	3.10	99	2.90	58
21....	2.88	472	2.30	237	2.02	168	1.90	144	2.90	98	2.70	55
22....	2.85	458	2.30	237	2.00	164	1.90	144	2.80	96	2.85	58
23....	2.80	435	2.28	231	2.00	164	1.88	140	2.75	93	2.98	60
24....	2.75	412	2.26	225	2.01	166	1.88	140	2.60	90	2.96	60
25....	2.75	412	2.24	219	2.02	168	1.86	137	2.65	86	2.98	62
26....	2.70	390	2.25	222	2.00	164	1.88	140	2.60	81	2.95	64
27....	2.70	390	2.23	217	1.98	160	1.95	154	2.57	77	2.98	65
28....	2.70	390	2.22	214	1.96	156	1.93	150	2.57	73	3.10	68
29....	2.65	368	2.20	209	1.95	154	1.90	144	2.65	70	3.20	70
30....	2.60	346	2.18	204	1.95	154	1.88	140	2.70	70	3.25	72
31....	2.58	337	2.20	209	.....	.....	1.87	139	.....	.....	3.26	72

MONTHLY DISCHARGE OF Crowsnest river near Lundbreck, for 1916

(Drainage area 276 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	77	52	62	0.225	0.26	3,812
February.....	293	70	144	0.522	0.56	8,283
March.....	342	195	248	0.898	1.04	15,249
April.....	928	207	404	1.460	1.63	24,040
May.....	1,241	530	712	2.580	2.97	43,779
June.....	1,870	630	1,116	4.040	4.51	66,407
July.....	1,308	337	664	2.410	2.78	40,828
August.....	377	204	270	0.978	1.13	16,602
September.....	252	154	191	0.692	0.77	11,365
October.....	156	137	146	0.529	0.61	8,977
November.....	144	70	107	0.388	0.43	6,367
December.....	75	44	58	0.210	0.24	3,566
The year.....					16.93	249,275

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of Crowsnest river near Lundbreck

MONTH	1907-8	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		149	143	219	257	132	148	310	160	146	185	11,371
November			175	188c	175	145	120	225	136	107	155	9,207
December					79	105	103	123	92	58	93	5,738
January				85	98	78	84	131	62		90	5,508
February				91	86	69	72	79	144		90	5,080
March				111	97	77	91	95	248		103	7,365
April		235b	445	352	324	411	333	307	404		368	21,894
May		847	583	976	530	706	589	861	712		726	44,606
June		1,425	450	996	488	717	438	600	1,116		779	46,339
July		785	245	736	487	330	271	458	664		497	30,568
August		439	138	345	239	240	177	251	270		262	16,124
September	152a	187	134	559	151	164	169	161	191		214	12,766
Total in Acre-feet	4,522	239,899	139,814	280,226	182,507	191,849	159,028	218,380	253,953			216,566

a 16-30.
b 15-30.
c 1-26.

CONNELLY CREEK NEAR LUNDBRECK

Location.—On SE. $\frac{1}{4}$ Sec. 36, Tp. 7, Rge. 2, W. 5th Mer.

Records.—Discharge measurements only are available from August 20, 1908, to December 31, 1916. Gauge height records are available from August 1 to October 31, 1909; since then there has been no observer at this station.

Gauge.—Vertical staff, nailed to a tree on the left bank; zero elevation of gauge 96.07 feet.

Bench-mark.—On the head of a bolt driven vertically in a notch cut in a leaning tree, on the left bank; assumed elevation 100.00 feet.

Discharge measurements.—Made with current-meter by wading in high water and by means of an 18-inch weir in low stages.

Winter flow.—Discharge measurements are not made during the winter season.

DISCHARGE MEASUREMENTS of Connelly creek near Lundbreck, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 21	J. M. Paul	12.0	10.0	2.00	2.82	20.00
April 11	do	11.5	8.2	1.58	2.60	13.00
May 16	W. M. Edwards	12.0	7.7	1.50	2.58	11.50
June 7	do	12.0	7.1	2.12	2.73	19.20
June 26	W. H. Hannan	11.5	7.3	1.72	2.65	12.50
July 6	W. M. Edwards	11.5	8.6	1.92	2.68	16.50
Aug. 9	do	10.5	5.4	1.27	2.46	7.00
Sept. 7	do	10.0	5.1	0.52	2.28	2.70
Nov. 21	do	7.0	2.8	0.64	2.51	1.75

COW CREEK NEAR COWLEY

Location.—On NE. $\frac{1}{4}$ Sec. 14, Tp. 8, Rge. 2, W. 5th Mer., at John Ross ranch, five miles north of Lundbreck.

Records available.—August 20, 1908, to October 31, 1915.

Gauge.—Vertical enamel staff, graduated to hundredths; zero elevation maintained at 94.53 feet during 1912-16.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Clay and rocks, fairly permanent.

Discharge measurements.—Made with current-meter from a foot bridge during high water and by wading in low stages.

Winter flow.—Discharge measurements are not made during the winter season.

Observer.—Thos. Ford.

DISCHARGE MEASUREMENTS of Cow creek near Cowley, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 21.....	J. M. Paul.....	8.0	11.60	2.41	2.87	28.0
April 11.....	do.....	8.5	12.50	1.51	2.48	18.9
May 11.....	W. M. Edwards.....	8.5	11.50	1.30	2.37	14.9
June 7.....	do.....	9.0	14.20	1.87	2.72	26.0
June 26.....	W. H. Hannan.....	9.0	13.90	1.52	2.62	25.0
July 6.....	W. M. Edwards.....	9.0	15.20	1.91	2.68	29.0
Aug. 9.....	do.....	8.5	11.40	1.31	2.35	15.0
Sept. 7.....	do.....	9.0	7.93	0.68	1.85	5.4
Nov. 21.....	do.....	9.0	6.50	0.85	1.98	5.5

DAILY GAUGE HEIGHT AND DISCHARGE of Cow creek near Cowley, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			2.40	15.0e	2.50	19.6	3.05	40.0
2.....			2.55	20.0e	2.60	19.6	2.80	30.0
3.....			2.30	13.0e	2.40	16.4	2.75	28.0
4.....			2.30	13.0e	2.40	16.4	2.65	25.0
5.....			2.35g	13.0e	2.30	13.6	2.65	25.0
6.....			2.20	11.0	2.50	19.6	2.60	23.0
7.....			2.30	13.6	2.60	23.0	2.70	26.0
8.....			2.30	13.6	2.41	16.8	2.55	21.0
9.....			2.40	16.4	2.41	16.8	2.65	25.0
10.....			2.45	18.0	2.36	15.3	2.90	34.0
11.....			2.50	19.6	2.40	16.4	2.80	30.0
12.....			2.40	16.4	2.50	19.6	2.65	26.0
13.....			2.35	15.0	2.55	21.0	2.60	23.0
14.....			2.50	19.6	2.40	16.4	2.55	21.0
15.....			2.60	23.0	2.45	18.0	2.55	21.0
16.....			2.30	13.6	2.50	19.6	2.50	19.6
17.....			2.30	13.6	2.30	13.6	2.55	21.0
18.....			2.20	11.0	2.30	13.6	2.65	25.0
19.....			2.20	11.0	2.25	12.3	2.75	28.0
20.....			2.15	9.8	2.25	12.3	2.85	32.0
21.....	2.87g	28.0e	2.20	11.0	2.30	13.6	3.05	40.0
22.....	2.80	27.0e	2.20	11.0	2.30	13.6	2.95	36.0
23.....	2.70	25.0e	2.10	8.6	2.40	16.4	2.80	30.0
24.....	2.55	18.0e	2.10	8.6	2.50	19.6	2.65	25.0
25.....	2.70	25.0e	2.15	9.8	2.50	19.6	2.70	26.0
26.....	2.70	25.0e	2.20	11.0	2.55	21.0	2.62	24.0
27.....	2.60	22.0e	2.20	11.0	2.70	26.0	3.15	44.0
28.....	2.60	22.0e	2.25	12.3	2.80	30.0	3.60	62.0
29.....	2.65	24.0e	2.30	13.6	2.95	36.0	3.20	46.0
30.....	2.60	22.0e	2.40	16.4	3.05	40.0	3.10	42.0
31.....	2.65	24.0e	.....	.....	2.90	34.0	.....	.....

g-g Gauge heights affected by ice.

e Discharge estimated.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Cow creek near Cowley, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	2.90	34.0	1.95	5.6	1.85	4.0	1.85	4.00
2	3.65	64.0	1.90	4.8	1.90	4.8	1.90	4.80
3	3.15	44.0	1.95	5.6	1.95	5.6	1.90	4.80
4	2.95	36.0	1.90	4.8	2.60	23.0	1.95	5.60
5	2.65	25.0	1.90	4.8	2.50	19.6	1.85	4.00
6	2.68	26.0	1.90	4.8	1.90	4.8	1.90	4.80
7	2.45	18.0	1.89	4.6	1.85	4.0	1.92	5.00
8	2.55	21.0	1.85	4.0	1.85	4.0	1.65	1.55
9	2.50	19.6	2.35	15.0	1.85	4.0	1.60	1.05
10	2.45	18.0	2.20	11.0	1.90	4.8	1.85	4.00
11	2.45	18.0	2.10	8.6	1.85	4.0	1.80	3.30
12	2.45	18.0	1.95	5.6	1.80	3.3	1.80	3.30
13	2.48	18.9	1.85	4.0	1.80	3.3	1.80	3.30
14	2.40	16.4	2.10	8.6	1.85	4.0	1.80	3.30
15	2.30	13.6	2.00	6.6	1.85	4.0	1.78	3.00
16	2.28	13.1	1.90	4.8	1.85	4.0	1.75	2.60
17	2.35	15.0	1.85	4.0	1.85	4.0	1.80	3.30
18	2.35	15.0	1.90	4.8	1.85	4.0	1.85	4.00
19	2.28	13.1	2.00	6.6	1.80	3.3	1.80	3.30
20	2.20	11.0	1.90	4.8	1.80	3.3	1.85	4.00
21	1.98	6.1	1.90	4.8	1.80	3.3	1.90	4.80
22	2.05	7.6	1.85	4.0	1.80	3.3	1.85	4.00
23	2.00	6.6	1.85	4.0	1.80	3.3	1.85	4.00
24	2.02	7.0	1.80	3.3	1.80	3.3	1.90	4.80
25	2.00	6.6	1.85	4.0	1.80	3.3	1.80	3.30
26	2.05	7.6	1.95	5.6	1.80	3.3	1.80	3.30
27	2.08	8.2	1.90	4.8	1.80	3.3	1.95	5.60
28	2.05	7.6	1.90	4.8	1.85	4.0	1.95	5.60
29	2.03	7.2	1.85	4.0	1.85	4.0	1.90	4.80
30	2.05	7.6	1.85	4.0	1.80	3.3	1.85	4.00
31	2.05	7.6	1.85	4.0			1.80	3.30

MONTHLY DISCHARGE of Cow creek near Cowley, for 1916

(Drainage area 29 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (21-31)	28.0	18.00	24.0	0.828	0.34	524
April	23.0	8.60	13.8	0.476	0.53	821
May	40.0	12.30	19.7	0.679	0.79	1,211
June	62.0	19.60	30.0	1.030	1.15	1,785
July	64.0	6.10	17.3	0.597	0.69	1,064
August	15.0	3.30	5.5	0.190	0.22	338
September	23.0	3.30	5.0	0.172	0.19	298
October	5.6	1.05	3.9	0.134	0.15	240
The period					4.06	6,281

MEAN MONTHLY DISCHARGE in Second-feet, of Cow creek near Cowley

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		3.50	1.01	6.4	3.60	1.72	3.90	4.3	3.9	3.5	218
November.....				2.7 _c	5.60 _e						
December.....											
January.....											
February.....											
March.....						5.20 _g	14.6 _h	24.0 _i			
April.....		17.80 _b	17.3 _d	28.30 _f	17.10	9.0	13.8			13.3	792
May.....		6.60 _a	27.80	11.8	20.10	13.10	31.0	19.7		21.0	1,266
June.....		3.70	15.00	8.8	17.90	9.70	37.0	30.0		17.3	1,028
July.....		0.96	2.80	8.2	5.00	4.30	21.0	17.3		8.5	523
August.....	12.4	0.36	7.40	4.9	2.10	1.91	6.2	5.5		5.1	314
September.....	4.6	0.66	10.60	3.3	1.43	1.78	3.5	5.0		3.9	230
Total in acre-ft....	1,036	617	4,595	3,535	4,113	3,169	7,285	6,305			4,371

a 26-31.

b 12-30.

c 1-11.

d 7-30.

e 1-15.

f 14-30.

g 15-31.

h 14-31.

i 21-31.

HUFF DITCH NEAR COWLEY

Location.—On the NW. $\frac{1}{4}$ Sec. 30, Tp. 8, Rge. 1, W. 5th Mer.*Records available.*—May 10, 1915, to October 31, 1916.*Gauge.*—Vertical staff; zero elevation maintained at 95.41 feet since establishment.*Bench-mark.*—Nail on post 175 feet west of gauge; assumed elevation 100.00 feet.*Discharge measurements.*—Made by wading with current-meter, or with weir.*Observer.*—W. H. Connor.*Remarks.*—Station visited nine times during open water season; no water used.

ELTON DITCH FROM TODD CREEK

Location.—On SW. $\frac{1}{4}$ Sec. 19, Tp. 8, Rge. 1, W. 5th Mer., on Elton's ranch, seven miles north of Cowley.*Records available.*—June 6, 1914, to October 31, 1916.*Gauge.*—Vertical staff. Zero elevation of gauge 103.07 referred to permanent iron bench-mark at Todd Creek station.*Bench-mark.*—Two spikes in a post 150 feet south of the gauge, elevation 1.66 feet above the zero of the gauge. These spikes have elevation of 104.73 feet referred to permanent iron bench-mark at station on Todd creek, assumed elevation of which is 100.00 feet.*Channel.*—Clay and fairly permanent.*Discharge measurements.*—Made by wading.*Observer.*—Cecil Elton.

DISCHARGE MEASUREMENTS of Elton ditch from Todd creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 21.....	J. M. Paul.....				Dry	Nil
April 11.....	do.....	2.0	0.60	0.48	2.11	0.29
May 11.....	W. M. Edwards.....					0.20 _e
June 7.....	do.....	2.5	1.47	0.93	2.37	1.37
June 26.....	W. H. Hannan.....					0.32
July 6.....	W. M. Edwards.....	2.0	0.64	0.50	2.05	0.30 _e
Aug. 9.....	do.....				Dry	Nil
Sept. 7.....	do.....				do	do
Nov. 21.....	do.....				do	do

_e Discharge estimated from field inspection.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Elton ditch from Todd creek, for 1916

DAY	May		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			2.11	0.37	2.11	0.37
2.....			2.10	0.35	2.12	0.40
3.....			2.10	0.35	2.12	0.40
4.....			2.09	0.33	2.11	0.37
5.....			2.09	0.33	2.07	0.29
6.....			2.10	0.35	2.05	0.25
7.....			2.33 ^h	1.17	2.05	0.25
8.....			2.60	2.60	2.03	0.22
9.....			2.61	2.70	2.02	0.21
10.....			2.61	2.70	2.00	0.18
11.....			2.62	2.70	2.01	0.19
12.....			2.61	2.70	2.00	0.18
13.....			2.61	2.70	2.02	0.21
14.....			2.63	2.80	2.00	0.18
15.....			2.63	2.80	2.00	0.18
16.....				2.70	1.97	0.14
17.....			2.59	2.60	1.97	0.14
18.....			2.38 ^h	1.42	2.00	0.18
19.....			2.18	0.56	1.99	0.17
20.....			2.20	0.62	1.97	0.14
21.....			2.19	0.59	1.97	0.14
22.....			2.18	0.56	1.97	0.14
23.....			2.17	0.53	1.96	0.13
24.....	2.07	0.29	2.15	0.47	1.96	0.13
25.....	2.08	0.31	2.07	0.29	1.97	0.14
26.....	2.09	0.33	2.07	0.29	2.00	0.18
27.....	2.09	0.33	2.09	0.33	1.98	0.16
28.....	2.09	0.33	2.09	0.33	1.98	0.16
29.....	2.11	0.37	2.12	0.40	1.98	0.16
30.....	2.10	0.35	2.11	0.37	1.98	0.16
31.....	2.11	0.37				

^{h-h} Head-gate opened; flow during other part of season due to leakage past head-gate.

MONTHLY DISCHARGE of Elton ditch from Todd creek, for 1916

MONTH	DISCHARGE IN SECOND-FEET			Total Discharge in acre-ft.
	Maximum	Minimum	Mean	
May (24-31).....	0.37	0.29	0.34	5.4
June.....	2.80	0.29	1.23	73.0
July (1-30).....	0.40	0.13	0.20	11.9
The period.....				90.3

TODD CREEK AT ELTON'S RANCH

Location.—On SW. $\frac{1}{4}$ Sec. 19, Tp. 8, Rge. 1, W. 5th Mer., near Cecil Elton's house, seven miles north of Cowley.

Records available.—August 20, 1908, to October 31, 1916.

Gauge.—Vertical staff. Elevation of zero maintained at 93.30 feet during 1909-11. Elevation of zero maintained at 93.02 feet during 1912-16.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Sand and gravel, quite permanent.

Discharge measurements.—Are made from a foot-bridge during high water, and by wading during low stages.

Winter flow.—No discharge measurements are made during the winter season.

Observer.—C. W. S. Elton.

DISCHARGE MEASUREMENTS of Todd creek at Elton's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 21.....	J. M. Paul.....	19.0	20.4	1.59	4.30	32.0
April 11.....	do.....	19.5	28.0	1.39	3.27	39.0
May 11.....	W. M. Edwards.....	21.0	29.1	1.31	3.16	38.0
June 7.....	do.....	20.0	33.8	1.78	3.42	60.0
June 26.....	W. H. Hannan.....	21.0	35.2	1.85	3.47	64.0
July 6.....	W. M. Edwards.....	19.0	33.3	2.05	3.53	68.0
Aug. 9.....	do.....	19.5	22.6	0.85	2.95	19.0
Sept. 7.....	do.....	20.5	20.8	0.58	2.75	12.1
Nov. 21.....	do.....	15.0	10.6	1.03	3.00	10.9

DAILY GAUGE HEIGHT AND DISCHARGE of Todd creek at Elton's ranch, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			5.33	3.30	3.22	42	3.53	68		
2.....			5.33	3.43	3.26	45	3.52	67		
3.....			5.33	3.25	3.18	39	3.46	62		
4.....			5.33	3.20	3.14	36	3.36	53		
5.....			5.41	3.16	3.14	36	3.38	55		
6.....			5.49	3.12 ^b	3.14	36	3.42	58		
7.....			5.49	3.12	3.20	40	3.38	55		
8.....			5.54	3.23	3.20	40	3.36	53		
9.....			7.17	3.28	3.16	37	3.34	52		
10.....			8.04	3.24	3.15	37	3.36	53		
11.....			6.89	3.10	3.14	36	3.42	58		
12.....			6.57	3.17	3.22	42	3.40	57		
13.....			6.23	3.14	3.32	50	3.40	57		
14.....			5.91	3.16	3.30	48	3.38	55		
15.....			5.35	3.20	3.24	44	3.36	53		
16.....	10.04 ^b		5.11	3.12	3.20	40	3.35	52		
17.....	6.87		4.91	3.18	3.18	39	3.40	57		
18.....	6.68		4.81	3.16	3.15	37	3.50	65		
19.....	6.37		4.69	3.12	3.14	36	3.55	70		
20.....	5.49		4.58	3.11	3.14	36	3.65	80		
21.....	5.64		4.59	3.02	3.12	34	3.76	91		
22.....	5.79		4.61	3.02	3.12	34	3.75	90		
23.....	5.37		4.24	2.99	3.15	37	3.65	80		
24.....	5.40		4.05	2.98	3.19	40	3.56	71		
25.....	5.38		4.01	2.97	3.24	44	3.55	70		
26.....	5.34		4.04	3.02	3.34	52	3.46	62		
27.....	5.30		3.77	3.00	3.35	52	3.59	74		
28.....	5.27		3.77	3.08	3.35	52	3.66	81		
29.....	5.33		3.61	3.10	3.61	76	4.13	130		
30.....			3.75	3.14	3.56	71	4.05	121		
31.....			3.43		3.59	74				

b-b Ice conditions and water on ice, so discharge cannot be computed.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Todd creek at Elton's ranch, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	3.78	93	2.92	21.0	2.70	8.2	2.68	7.20
2.....	3.80	95	2.90	19.3	2.71	8.7	2.71	8.70
3.....	4.04	120	2.88	18.0	2.72	9.2	2.70	8.20
4.....	3.85	100	2.87	17.3	2.94	22.0	2.69	7.70
5.....	3.70	84	2.84	15.5	3.05	29.0	2.72	9.20
6.....	3.59	74	2.86	16.7	2.88	18.0	2.74	10.30
7.....	3.50	65	2.86	16.7	2.78	12.4	2.77	11.80
8.....	3.40	57	2.87	17.3	2.73	9.8	2.75	10.80
9.....	3.34	52	2.90	19.3	2.70	8.2	2.72	9.20
10.....	3.30	48	3.00	26.0	2.70	8.2	2.70	8.20
11.....	3.30	48	2.98	24.0	2.69	7.7	2.70	8.20
12.....	3.34	52	2.90	19.3	2.68	7.2	2.67	6.80
13.....	3.27	46	2.86	16.7	2.70	8.2	2.66	6.30
14.....	3.24	44	2.84	15.5	2.70	8.2	2.65	5.80
15.....	3.23	43	2.84	15.5	2.70	8.2	2.65	5.80
16.....	3.22	42	2.80	13.4	2.69	7.7	2.65	5.80
17.....	3.16	37	2.74	10.3	2.68	7.2	2.66	6.30
18.....	3.15	37	2.87	17.3	2.69	7.7	2.66	6.30
19.....	3.13	35	2.80	13.4	2.68	7.2	2.66	6.30
20.....	3.10	33	2.79	12.9	2.66	6.3	2.67	6.80
21.....	3.07	31	2.74	10.3	2.66	6.3	2.68	7.20
22.....	3.06	30	2.70	8.2	2.68	7.2	2.72	9.20
23.....	3.01	27	2.70	8.2	2.70	8.2	2.71	8.70
24.....	3.00	26	2.70	8.2	2.68	7.2	2.68	7.20
25.....	3.00	26	2.71	8.7	2.68	7.2	2.65	5.80
26.....	3.07	31	2.74	10.3	2.66	6.3	2.66	6.30
27.....	3.04	29	2.70	8.2	2.65	5.8	2.66	6.30
28.....	3.01	27	2.68	7.2	2.66	6.3	2.65	5.80
29.....	2.98	24	2.68	7.2	2.68	7.2	2.68	7.20
30.....	2.95	23	2.69	7.7	2.68	7.2	2.56	1.48
31.....	2.94	22	2.68	7.2	.....	.....	2.61	3.90

MONTHLY DISCHARGE of Todd creek at Elton's ranch, for 1916

(Drainage area 57 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April.....	47.0	24.00	34.0	0.596	0.53	1,285
May.....	76.0	34.00	44.0	0.772	0.89	2,705
June.....	130.0	52.00	68.0	1.190	1.33	4,046
July.....	120.0	22.00	48.0	0.842	0.97	2,951
August.....	26.0	7.20	14.2	0.249	0.29	873
September.....	29.0	5.80	9.3	0.016	0.02	553
October.....	11.8	1.48	7.3	0.013	0.01	449
The period.....	.....	.....	.....	.....	4.04	13,184

MEAN MONTHLY DISCHARGE in Second-feet, of Todd creek at Elton's ranch

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		6.7	3.3	15.1	8.5	5.8	9.6	12.7	7.3	8.6	531
November				13.9 ^b	10.4 ^d						
December											
January											
February											
March						6.5 ^f	63.0 ^g				
April		9.8	31.0 ^a	25.0 ^c	45.0 ^e	29.0	19.8	34.0		23.0	1,194
May		19.2	52.0	23.0	44.0	23.0	65.0	44.0		39.0	2,369
June		10.9	43.0	20.0	43.0	20.0	85.0	68.0		41.0	2,463
July		3.7	13.9	21.0	14.0	10.0	57.0	48.0		24.0	1,475
August	19.8	2.1	18.4	14.4	7.3	6.1	16.4	14.2		12.3	758
September	7.7	3.2	22.0	9.6	4.9	5.7	11.1	9.3		9.2	548
Total in acre-ft. . .	1,678	3,371	10,201	7,306	8,801	6,220	17,995	13,194			9,338

^a 16-30.^b 1-4.^c 12-30.^d 1-15.^e 18-30.^f 16-31.^g 16-31.

OLDMAN RIVER NEAR COWLEY

Location.—On the NE. $\frac{1}{4}$ of Sec. 34, Tp. 7, Rge. 1, W. 5th Mer.*Records available.*—June 17, 1908, to December 31, 1916. One discharge measurement in 1907.*Gauge.*—Vertical staff; elevation of zero maintained at 92.08 feet since establishment.*Bench-mark.*—Permanent iron bench-mark on right bank; assumed elevation 100.00 feet.*Channel.*—Rock and gravel.*Discharge measurements.*—Made with current-meter from cable car at ordinary stages and by wading at low water.*Observer.*—Archie McKay.

DISCHARGE MEASUREMENTS of Oldman river near Cowley, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 13	W. R. McCaffrey	105	105.0	1.18	2.57 ^b	124
Jan. 29	H. W. Rowley	90	76.0	1.59	2.65 ^b	121
Feb. 12	do	100	61.5	1.44	2.52 ^b	88
Feb. 19	J. E. Caughey	97	170.0	2.32	1.83 ^b	420
Feb. 26	H. W. Rowley	88	142.0	1.40	1.36	199
Mar. 21	J. M. Paul	185	217.0	2.15	1.79	466
April 13	do	171	220.0	2.11	1.85	465
May 16	W. M. Edwards	185	285.0	2.21	2.24	829
June 13	do	200	528.0	5.12	3.52	2,702
June 22	W. H. Hannan	203	700.0	5.71	4.22	3,996
June 24	do	199	596.0	5.32	3.70	3,169
June 28	do	202	657.0	5.78	4.14	3,793
June 30	do	201	637.0	6.16	4.12	3,928
July 12	W. M. Edwards	197	424.0	4.53	3.06	1,909
Aug. 8	do	183	192.0	2.24	1.83	431
Sept. 5	do	188	256.0	2.76	2.19	707
Oct. 14	E. J. Switzer	181	156.0	1.82	1.53	284
Nov. 20	W. M. Edwards	187	146.0	1.08	2.17 ^b	158
Dec. 9	do	176	95.2	1.04	1.89 ^b	99
Dec. 29	E. J. Switzer	103	72.0	1.53	2.15 ^b	110

^b Ice conditions.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Oldman river near Cowley, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	2.94b	103	2.85	110	1.05	75	2.50	1,134	2.30	896	2.84	1,576
2	3.00	97	3.00	106	1.10	92	2.46	1,084	2.60	1,258	2.92	1,690
3	3.02	92	2.65	102	1.20	131	2.30	896	2.64	1,308	2.94	1,721
4	3.10	90	2.85	98	1.25	152	2.32	919	2.80	1,521	3.48	2,624
5	3.15	88	3.05	92	1.35	197	1.52	278	2.92	1,690	3.62	2,876
6	3.18	88	2.95	91	1.60	317	1.55	292	3.10	1,974	3.51	2,678
7	3.20	91	2.95	90	1.80	431	1.63	332	3.12	2,006	3.54	2,732
8	3.20	95	3.00	88	1.60	317	1.90	500	3.00	1,814	3.64	2,912
9	3.13	101	2.75	88	1.80	431	1.92	516	2.94	1,721	3.80	3,200
10	3.05	107	2.80	88	2.00	585	1.92	516	2.78	1,494	3.62	2,776
11	3.15	112	2.55	88	2.30	896	1.93	524	2.58	1,233	3.51	2,678
12	3.10	118	2.52	88	2.30	896	1.88	486	2.48	1,109	3.50	2,660
13	2.58	124	2.55	120	1.85	465	1.82	445	2.30	896	3.52	2,696
14	3.05	132	2.55	640	1.90	500	1.84	458	2.31	907	3.92	3,421
15	3.10	132	4.50b	1,210	1.85	465	2.02	603	2.29	885	4.17	3,894
16	3.15	128	3.35	2,390	1.68	359	1.96	549	2.23	818	4.34	4,228
17	2.35	122	2.15	730	1.85	465	1.94	532	2.22	806	4.87	5,288
18	2.75	118	2.05	630	2.00	585	1.85	465	2.35	953	4.72	4,988
19	3.15	114	2.10	680	1.65	342	1.74	394	2.44	1,060	5.22	5,988
20	3.25	112	3.61	2,858	1.89	493	1.82	445	2.94	1,721	4.81	5,168
21	3.65	114	3.63	2,894	1.90	500	1.84	458	2.94	1,721	4.92	5,388
22	3.05	118	3.43	2,534	1.90	500	1.80	431	2.92	1,690	4.42	4,388
23	.....	122e	3.38	2,444	1.80	431	1.82	445	2.96	1,752	4.07	3,702
24	.....	125e	3.13	2,023	1.89	493	1.92	516	2.98	1,783	4.17	3,894
25	.....	128e	2.73	1,426	1.79	425	2.00	585	2.99	1,798	3.77	3,146
26	.....	129e	1.36	202	1.80	431	2.40	1,010	3.01	1,830	3.62	2,876
27	.....	129e	1.09	89	1.98	567	2.50	1,134	3.01	1,830	3.90	3,384
28	.....	126e	1.12	100	1.80	431	2.64	1,308	2.84	1,576	4.17	3,894
29	2.60	121	1.10	92	1.95	540	2.69	1,373	2.92	1,690	4.24	4,029
30	.....	118e	.....	.....	1.65	342	2.00	585	2.94	1,721	4.12	3,798
31	.....	114e	.....	.....	1.80	431	.....	.....	2.92	1,690	.....	.....

b-b Ice conditions.

e Discharge estimated

DAILY GAUGE HEIGHT AND DISCHARGE of Oldman river near Cowley, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	3.97	3,513	2.06	640	1.80	431	1.57	302	1.52	278	1.92	122
2....	4.44	4,428	2.02	603	1.82	445	1.64	337	1.60	317	1.97	120
3....	4.47	4,488	1.97	558	1.92	516	1.59	312	1.62	327	1.93	116
4....	4.27	4,088	1.97	558	2.28	874	1.55	292	1.62	327	2.02	111
5....	3.87	3,329	1.97	558	2.35	953	1.50	268	1.67	354	1.97	108
6....	3.82	3,237	1.94	532	2.21	795	1.51	273	1.62	327	1.97	105
7....	3.75	3,110	2.02	603	2.21	795	1.53	282	1.37	206	1.92	102
8....	3.54	2,732	2.07	650	2.19	773	1.51	273	1.406	197	1.68	100
9....	3.30	2,305	1.98	567	2.17	752	1.59	312	1.52	193	1.89	99
10....	3.30	2,305	2.02	603	1.99	576	1.60	317	1.62	187	2.03	98
11....	3.24	2,204	2.00	585	1.91	508	1.63	332	1.52	184	1.98	98
12....	2.97	1,767	1.94	532	1.81	438	1.61	322	1.52	179	2.08	97
13....	2.92	1,690	2.00	585	1.79	425	1.67	354	1.52	177	2.08	97
14....	2.82	1,549	1.92	516	1.71	377	1.53	282	1.57	174	2.08	96
15....	2.76	1,467	1.90	500	1.71	377	1.55	292	1.58	169	2.08	95
16....	2.62	1,283	1.82	445	1.75	400	1.56	297	1.52	168	2.03	94
17....	2.56	1,208	1.80	431	1.70	371	1.54	287	1.62	164	2.08	93
18....	2.52	1,159	1.90	500	1.71	377	1.53	282	1.60	162	2.18	92
19....	2.56	1,208	1.80	431	1.63	334	1.52	278	1.58	160	2.18	91
20....	2.51	1,246	1.79	425	1.67	354	1.57	302	1.82	158	2.23	91
21....	2.43	1,047	1.80	431	1.61	322	1.61	322	1.87	155	2.18	91
22....	2.42	1,035	1.81	438	1.60	311	1.61	322	1.87	151	2.08	92
23....	2.33	930	1.80	431	1.61	322	1.51	273	1.92	148	2.18	92
24....	2.32	919	1.81	438	1.69	365	1.47	254	1.87	146	2.08	94
25....	2.22	806	1.77	412	1.63	332	1.51	273	1.91	144	2.08	97
26....	2.22	806	1.80	431	1.61	322	1.45	244	1.92	140	1.98	100
27....	2.21	795	1.72	383	1.61	322	1.42	230	1.92	137	2.08	102
28....	2.18	762	1.70	371	1.61	322	1.43	234	1.87	133	2.13	105
29....	2.14	720	1.69	365	1.59	312	1.51	273	1.92	128	2.13	110
30....	2.14	720	1.66	348	1.61	322	1.48	258	1.87	126	2.08	112
31....	2.14	720	1.60	317	.....	.....	1.51	273	.....	.....	2.13 ^b	111

^{b-b} Ice conditions.^e Discharge estimated.

MONTHLY DISCHARGE of Oldman river near Cowley, for 1916

(Drainage area 800 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	132	88	92	0.115	0.13	5,657
February.....	2,594	88	762	0.952	1.03	43,831
March.....	896	75	428	0.535	0.62	26,317
April.....	1,373	278	640	0.800	0.89	38,083
May.....	2,006	806	1,747	2.180	2.51	107,393
June.....	5,988	1,576	3,476	4.340	4.84	206,787
July.....	4,488	720	1,857	2.380	2.74	114,155
August.....	650	317	490	0.612	0.71	30,129
September.....	953	311	471	0.589	0.66	28,026
October.....	354	230	289	0.362	0.42	17,770
November.....	354	126	194	0.242	0.27	11,544
December.....	122	91	101	0.126	0.14	6,210
The year.....	.....	.....	.....	.....	14.96	635,902

SESSIONAL PAPER No. 25B

MEAN MONTHLY DISCHARGE in Second-feet, of Oldman river near Cowley

MONTH	1907-8	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		181	178	324	371	223	283	449	407	289	301	18,482
November				d274	266	204	255	375	322	194	186	16,026
December					182	147	176	155	149	101	152	9,326
January				97	84	112	122	172	92		113	6,965
February				117	85	116	90	106	762		213	12,095
March				110	e88	104	97	105	428		169	10,379
April				369	540	714	372	494	640		522	31,032
May		1,433	e1,250	1,262	826	1,709	1,346	2,306	1,747		1,518	93,354
June	a2,167	3,386	826	2,052	3,058	1,720	1,275	2,450	3,476		2,280	135,689
July	956	b1,381	324	565	1,079	601	605	1,341	1,857		916	56,313
August	311	682	191	809	557	548	270	693	490		506	31,091
September	186	252	213	996	253	333	202	401	471		367	21,868
Total in acre-ft.	149,146	423,400	139,137	473,588	443,240	394,993	308,411	548,274	653,725			442,620

a 17-30.

b 1-24.

c 18-31.

d 1-28.

e 1-15.

CARBONDALE CREEK AT EVANS' RANCH

Location.—SE. $\frac{1}{4}$ Sec. 15, Tp. 6, Rge. 3, W. 5th Mer.

Records available.—April 19, 1916, to December 15, 1916.

Gauge.—Enamel staff, graduated in feet and hundredths; elevation of zero 95.22.

Bench-mark.—Spike in tree on right bank and fifteen feet from gauge; assumed elevation 100.00 feet.

Channel.—May shift to a slight extent.

Discharge measurements.—With current-meter by cable at high stages, and wading at low stages.

Winter flow.—Station not maintained during winter.

Observer.—J. H. Davison.

DISCHARGE MEASUREMENTS of Carbondale creek at Evans' ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 19	J. M. Paul	85	114.0	2.18	0.86	249
May 15	W. M. Edwards	94	146.0	2.40	1.10	349
June 12	do				2.30	.....x
July 10	do				1.85	.....x
Aug. 7	do	82	77.6	1.80	0.40	140
Sept. 2	do	80	61.6	1.36	0.17	84
Nov. 23	do	43	24.9	1.17	0.05	29
Dec. 12	do	46	27.3	0.85	0.05	23

x Too deep to make wading measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Carbondale creek at Evans' ranch, for 1916

DAY	April		May		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.			1.28	365	1.62	460	2.25	648
2.			1.23	351	1.55	440	2.75	798
3.			1.86	531	2.00	573	2.62	759
4.			2.43	702	2.73	792	2.24	645
5.			2.64	765	2.66	771	2.30	663
6.			2.67	774	2.54	735	2.26	651
7.			2.50	723	2.52	729	2.00	573
8.			2.12	609	2.66	771	2.00	573
9.			1.85	528	2.60	753	1.95	558
10.			1.55	440	2.71	786	1.85	528
11.			1.41	401	2.43	702	1.82	519
12.			1.33	378	2.30	663	1.70	483
13.			1.21	346	2.54	735	1.65	468
14.			1.15	330	2.94	855	1.44	409
15.			1.10	316	3.25	948	1.41	401
16.				324e	3.45	1,008	1.38	392
17.			1.16	332	3.50	1,023	1.35	384
18.			1.23	351	3.42	999	1.17	335
19.	0.86	253	1.55	440	3.51	1,026	1.15	330
20.	0.85	250	1.63	463	3.55	1,038	1.12	321
21.	0.84	248	1.76	501	3.60	1,053	1.00	289
22.	0.75	226	1.71	486	3.20	933	0.92	268
23.	0.74	223	1.52	432	2.51	726	0.88	258
24.	0.77	230	1.40	398	2.43	702	0.85	250
25.	0.80	238	1.35	384	2.40	693	0.82	243
26.	1.10	316	1.26	359	2.42	699	0.80	238
27.	1.56	443	1.63	463	2.50	723	0.80	238
28.	1.58	448	2.10	603	2.65	768	0.78	233
29.	1.41	401	1.81	516	2.73	792	0.69	210
30.	1.25	356	1.70	483	2.15	618	0.67	206
31.			1.74	495			0.55	176

Discharge estimated.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Carbondale creek at Evans' ranch, for 1916.—*Concluded.*

DAY	August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	0.52	168	0.18	86	0.00	46	0.05	57	0.00	46
2.....	0.50	163	0.17	84	0.00	46	0.06	59	0.01	48
3.....	0.51	166	0.17	84	0.00	46	0.09	66	0.01	48
4.....	0.49	161	0.93	271	0.00	46	0.08	64	0.07	61
5.....	0.42	144	0.70	213	0.00	46	0.06	59	0.11	70
6.....	0.40	139	0.66	203	0.02	50	0.05	57	0.15	80
7.....	0.40	139	0.52	168	0.01	48	0.02	50	0.10	68
8.....	0.39	137	0.41	141	0.01	48	0.05	57	0.07	61
9.....	1.00	289	0.35	127	0.01	48	0.04	55	.....	59e
10.....	1.32	376	0.30	115	0.01	48	0.04	55	.....	57e
11.....	1.10	316	0.29	113	0.01	48	0.09	66	0.04	55
12.....	0.90	263	0.21	93	0.01	48	0.12	73	0.05	57
13.....	0.62	193	0.22	96	0.01	48	0.19	89	0.10	68
14.....	0.51	166	0.25	103	0.03	53	0.25	103	0.14	77
15.....	0.50	163	0.23	98	0.05	57	0.27	108	0.21	93
16.....	0.46	153	.....	96e	0.04	55	.....	117e	.....	.....
17.....	0.41	141	0.21	93	0.01	48	0.75	226	.....	.....
18.....	0.59	186	0.18	86	0.03	53	0.57	180	.....	.....
19.....	0.45	151	0.15	80	0.03	53	0.24	101	.....	.....
20.....	0.41	141	0.13	75	0.03	53	0.18	86	.....	.....
21.....	0.40	139	0.11	70	0.00	46	0.13	75	.....	.....
22.....	0.36	129	0.10	68	0.00	46	0.08	64	.....	.....
23.....	0.34	125	0.08	64	0.00	46	0.05	57	.....	.....
24.....	0.33	122	0.07	61	0.00	46	0.07	61	.....	.....
25.....	0.31	117	0.05	57	0.00	46	0.03	53	.....	.....
26.....	0.30	115	0.05	57	0.00	46	0.01	48	.....	.....
27.....	0.30	115	0.04	55	0.02	50	0.00	46	.....	.....
28.....	0.29	113	0.02	50	0.10	68	.....	46e	.....	.....
29.....	0.25	103	0.00	46	0.09	66	.....	46e	.....	.....
30.....	0.20	91	0.00	46	0.07	61	0.00	46	.....	.....
31.....	0.19	89	.....	.....	0.05	57	.....	.....	.....	.....

e Discharge estimated.

MONTHLY DISCHARGE of Carbondale creek, at Evans' ranch, for 1916

(Drainage area 143 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April (19-31).....	448	223	303	2.120	0.95	7,210
May.....	774	316	471	3.290	3.79	28,960
June.....	1,053	440	784	5.480	6.11	46,651
July.....	798	176	421	2.940	3.39	25,886
August.....	376	89	162	1.130	1.30	9,961
September.....	271	46	100	0.699	0.78	5,950
October.....	68	46	51	0.357	0.41	3,136
November.....	226	46	76	0.531	0.59	4,522
December (1-15).....	93	46	63	0.441	0.25	1,874
The period.....	.....	.....	.....	.....	17.57	134,150

CASTLE RIVER AT McDONALD'S RANCH

Location.—SW $\frac{1}{4}$ Sec. 30, Tp. 6, Rge. 2, W. 5th Mer.

Records available.—Station established April 18, 1916, and records available from that date to December 12, 1916.

Gauge.—Enamel staff, graduated in feet, tenths and hundredths. The elevation of zero is maintained at 90.53 feet.

Bench-mark.—Spike in poplar tree on left bank of river, twenty feet from the gauge; assumed elevation 100.00 feet.

Channel.—One channel fairly permanent.

Discharge measurements.—Made with current-meter by wading at ordinary stages.

Winter flow.—Station not maintained during winter.

Observer.—George Lang.

DISCHARGE MEASUREMENTS of Castle river at McDonald's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 18.	J. M. Paul.				1.80	x
May 15.	W. M. Edwards.				2.12	x
June 12.	do				3.55	x
July 10.	do				3.43	x
Aug. 7.	do	105	103	2.68	1.59	435
Sept. 2.	do	81	112	1.92	1.23	215
Oct. 19.	E. J. Switzer.	107	116	1.36	1.01	157
Nov. 23.	W. M. Edwards.	70	86	1.34	1.10	116
Dec. 12.	do	67	92	0.85	1.74	78

x Water too deep to make gauging.

DAILY GAUGE HEIGHT AND DISCHARGE of Castle river at McDonald's ranch, for 1916

DAY	April		May		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.			2.20	780	2.74	1,256	3.67	2,093
2.			2.27	836	2.74	1,256	4.12	2,498
3.			2.51	1,049	2.93	1,427	3.91	2,309
4.			2.99	1,481	3.09	1,571	3.78	2,192
5.			3.19	1,661	3.73	2,147	3.66	2,084
6.			3.29	1,751	3.52	1,958	3.53	1,967
7.			3.68	2,102	3.75	2,165	3.44	1,886
8.			3.26	1,724	3.75	2,165	3.46	1,904
9.			2.72	1,238	3.77	2,183	3.43	1,877
10.			2.66	1,184	3.76	2,174	3.43	1,877
11.			2.51	1,049	3.64	2,066	3.33	1,787
12.			2.37	923	3.44	1,886	3.28	1,742
13.			2.36	914	3.62	2,048	3.18	1,652
14.			2.10	700	3.88	2,282	3.08	1,562
15.			2.12	716	4.38	2,732	2.73	1,247
16.			2.07	678	4.80	3,110	2.77	1,283
17.			2.12	716	5.05	3,335	2.72	1,238
18.	1.80	485	2.16	748	5.11	3,389	2.66	1,184
19.	1.75	454	2.30	860	5.41	3,659	2.48	1,022
20.		451	2.47	1,013	5.47	3,713	2.43	977
21.	1.74	447	2.48	1,022	5.50	3,740	2.32	878
22.	1.70	422	2.52	1,058	5.11	3,389	2.28	844
23.	1.66	399	2.48	1,022	4.61	2,939	2.23	804
24.	1.65	394	2.43	977	3.56	1,994	2.21	788
25.	1.69	416	2.34	896	3.71	2,129	2.16	748
26.	1.75	454	2.28	844	3.72	2,138	2.13	724
27.	2.19	772	2.59	1,121	3.87	2,273	2.06	670
28.	2.36	914	2.77	1,283	4.42	2,768	1.93	572
29.	2.29	852	2.85	1,355	4.22	2,588	1.87	530
30.	2.16	748	2.84	1,346	4.04	2,426	1.83	504
31.			2.74	1,256			1.83	504

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Castle river at McDonald's ranch, for 1916.—*C?included.*

DATE	August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.	1.81	492	1.31	236	0.98	135	1.05	152	1.68	411
2.	1.75	454	.....	230	0.99	138	1.05	152	1.69	416
3.	1.72	435	1.28	225	0.96	130	1.05	152	1.70	422
4.	1.68	411	1.80	485	0.96	130	1.05	152	1.70	422
5.	1.68	411	1.70	422	1.02	145	1.04	150	1.71	428
6.	1.68	411	1.65	394	1.05	152	0.90	115	1.71	428
7.	1.54	335	1.55	340	1.06	155	0.94	125	1.73	441
8.	1.50	315	1.52	325	1.09	162	0.94	125	1.76	460
9.	2.00	625	1.49	310	1.08	160	0.98	135	1.77	466
10.	1.95	588	1.45	292	1.08	160	1.05	152	1.77	466
11.	1.70	422	1.40	270	1.06	155	1.01	142	1.74	447
12.	1.65	394	1.35	251	1.06	155	1.01	142	1.74 _x	447
13.	1.64	388	1.35	251	1.05	152	1.01	142	.....	.....
14.	1.60	365	1.34	247	1.05	152	.....	228	.....	.....
15.	1.55	340	2.29	852	1.03	148	1.50	315	.....	.....
16.	1.53	330	2.29	852	1.01	142	1.50	315	.....	.....
17.	1.50	315	1.26	218	.....	142	.....	245	.....	.....
18.	1.63	382	1.24	211	1.01	142	1.13	175	.....	.....
19.	1.60	365	1.24	211	1.01	142	1.13	175	.....	.....
20.	1.53	330	1.20	197	1.01	142	1.09	162	.....	.....
21.	1.50	315	1.16	184	1.00	140	1.07	158	.....	.....
22.	1.50	315	1.16	184	0.99	138	1.07	158	.....	.....
23.	1.45	292	1.16	184	0.98	135	1.10	165	.....	.....
24.	1.42	279	1.09	162	0.98	135	1.19	194	.....	.....
25.	1.40	270	1.06	155	0.98	135	1.19	194	.....	.....
26.	1.43	284	1.05	152	0.98	135	1.20	197	.....	.....
27.	1.40	270	1.01	142	1.03	148	1.34	247	.....	.....
28.	1.40	270	1.01	142	1.02	145	1.40	270	.....	.....
29.	1.38	262	1.00	140	.....	148	1.54	335	.....	.....
30.	1.34	247	0.99	138	1.05	152	1.64	388	.....	.....
31.	1.32	240	.....	.....	1.05	152	.....	.....	.....	.....

_x Station discontinued December 12.

MONTHLY DISCHARGE of Castle River at McDonald's ranch, for 1916

(Drainage area 271 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April (18-31).....	914	394	554	2.040	0.99	14,282
May.....	2,102	678	1,107	4.080	4.70	68,051
June.....	3,740	1,256	2,430	8.970	10.01	144,561
July.....	2,498	504	1,353	4.990	5.75	83,173
August.....	625	240	360	1.330	1.53	22,135
September.....	852	138	280	1.030	1.15	16,661
October.....	162	130	145	0.535	0.62	8,916
November.....	388	115	192	0.708	0.79	11,425
December.....	466	411	438	1.620	0.72	10,423
The period.....	.....	.....	.....	.....	26.26	379,627

CANYON CREEK NEAR MOUNTAIN MILL

Location.—On the NE. $\frac{1}{4}$ Sec. 14, Tp. 6, Rge. 2, W. 5th Mer.

Records available.—April 10, 1911, to October 31, 1915. Discharge measurements only in 1910.

Gauge.—Vertical staff; elevation of zero 85.51 feet.

Bench-mark.—Spike in tree on left bank; assumed elevation 100.00 feet.

Channel.—Clean gravel and rock.

Discharge measurements.—During high stages made with current-meter at traffic bridge one-half mile up stream; at ordinary stages by wading below the gauge.

Winter flow.—Station not maintained during the winter.

Observer.—G. Biron.

DISCHARGE MEASUREMENTS of Canyon creek near Mountain Mill, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 22.....	J. M. Paul.....	24	24.80	1.92	5.05	48.0
April 12.....	do.....	25	28.20	2.02	5.25	57.0
May 13.....	W. M. Edwards.....	24	23.80	1.88	5.05	45.0
June 8.....	do.....	24	33.40	2.15	5.40	82.0
July 7.....	do.....	23	24.30	1.78	5.00	43.0
Aug. 5.....	do.....	7	4.90	1.64	4.33	8.0
Sept. 6.....	do.....	12	7.80	0.87	4.22	6.8
Nov. 22.....	do.....	6	3.40	1.16	4.20	3.9

DAILY GAUGE HEIGHT AND DISCHARGE of Canyon creek near Mountain Mill, for 1916

DAY	March		April		May		June	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	4.20 ^b	5.5	4.97	41	5.25	62	5.65	102
2.....	4.20	5.5	4.96	40	5.20	58	5.50	86
3.....	4.20	5.5	4.94	39	5.20	58	5.44	79
4.....	4.21	5.8	4.97	41	5.25	62	5.40	75
5.....	4.21	5.8	4.90	36	5.27	63	5.60	96
6.....	4.21	5.8	4.97	41	5.27	63	5.65	102
7.....	4.21	5.8	4.98	42	5.28	64	5.50	86
8.....	4.21	5.8	5.05	46	5.15	54	5.40	75
9.....	4.22	6.0	5.04	46	5.10	50	5.37	72
10.....	4.22	6.0	5.20	58	5.05	46	5.38	73
11.....	4.30 ^b	8.0	5.23	60	5.02	44	5.32	68
12.....	4.35 ^g	9.8	5.24	61	5.00	43	5.22	59
13.....	5.20	58.0	5.15	54	5.00	43	5.15	54
14.....	4.87	34.0	5.20	58	4.97	41	5.12	52
15.....	4.90	36.0	5.30	66	4.95	40	5.12	52
16.....	4.85	33.0	5.25	62	5.00	43	5.05	46
17.....	4.86	34.0	5.16	54	4.95	40	5.00	43
18.....	4.66	22.0	5.10	50	4.92	37	5.00	43
19.....	4.86	34.0	5.10	50	4.95	40	5.05	46
20.....	5.00	43.0	5.05	46	4.94	39	5.08	49
21.....	5.15	54.0	5.06	47	4.90	36	5.35	70
22.....	5.05	46.0	5.10	50	4.90	36	5.10	50
23.....	4.95	40.0	5.05	46	4.87	34	5.05	46
24.....	4.90	36.0	5.03	45	4.96	40	5.00	43
25.....	4.85 ^g	33.0	5.01	44	5.05	46	4.96	40
26.....	4.87	34.0	5.05	46	5.04	46	4.95	40
27.....	4.95	40.0	5.05	46	5.30	66	5.05	46
28.....	4.87	34.0	5.10	50	5.55	91	5.15	54
29.....	4.75	27.0	5.15	54	5.50	86	5.25	62
30.....	4.81	31.0	5.10	50	5.65	102	5.15	54
31.....	4.90	36.0			5.55	91		

b-b Ice conditions; discharge estimated.

g-g Gauge height affected by ice going out.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Canyon creek near Mountain Mill, for 1916
—Concluded

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	5.02	44.0	4.37	10.4	4.20	5.5	4.18	5.0
2.....	5.44	79.0	4.35	9.8	4.21	5.8	4.18	5.0
3.....	5.30	66.0	4.34	9.4	4.19	5.2	4.18	5.0
4.....	5.16	54.0	4.32	8.7	4.29	7.8	4.18	5.0
5.....	5.04	46.0	4.32	8.7	4.24	6.5	4.17	4.8
6.....	5.00	43.0	4.30	8.0	4.22	6.0	4.22	6.0
7.....	4.95	40.0	4.29	7.8	4.20	5.5	4.22	6.0
8.....	4.96	40.0	4.27	7.2	4.19	5.2	4.19	5.2
9.....	4.90	36.0	4.48	14.3	4.18	5.0	4.20	5.5
10.....	4.86	34.0	4.57	18.2	4.20	5.5	4.20	5.5
11.....	4.85	33.0	4.47	14.0	4.18	5.0	4.20	5.5
12.....	4.80	30.0	4.42	12.2	4.17	4.8	4.19	5.2
13.....	4.85	33.0	4.37	10.4	4.21	5.8	4.18	5.0
14.....	4.75	27.0	4.35	9.8	4.20	5.5	4.18	5.0
15.....	4.74	27.0	4.31	8.4	4.18	5.0	4.19	5.2
16.....	4.71	25.0	4.28	7.5	4.18	5.0	4.18	5.0
17.....	4.69	24.0	4.29	7.8	4.17	4.8	4.21	5.8
18.....	4.65	22.0	4.40	11.5	4.16	4.5	4.21	5.8
19.....	4.66	22.0	4.35	9.8	4.15	4.2	4.21	5.8
20.....	4.60	19.5	4.32	8.7	4.15	4.2	4.19	5.2
21.....	4.55	17.2	4.30	8.0	4.15	4.2	4.19	5.2
22.....	4.55	17.2	4.27	7.2	4.15	4.2	4.18	5.0
23.....	4.54	16.8	4.25	6.8	4.15	4.2	4.16	4.5
24.....	4.54	16.8	4.24	6.5	4.18	5.0	4.24	6.5
25.....	4.54	16.8	4.23	6.2	4.14	4.0	4.22	6.0
26.....	4.50	15.0	4.26	7.0	4.16	4.5	4.22	6.0
27.....	4.53	16.4	4.24	6.5	4.15	4.5	4.28	7.5
28.....	4.48	14.3	4.22	6.0	4.15	4.2	4.25	6.8
29.....	4.46	13.6	4.20	5.5	4.15	4.2	4.25	6.8
30.....	4.44	12.9	4.19	5.2	4.14	4.0	4.24	6.5
31.....	4.40	11.5	4.19	5.2	.....	.....	4.24	6.5

MONTHLY DISCHARGE of Canyon creek near Mountain Mill, for 1916

(Drainage area 27 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March.....	58.0	5.5	25.0	0.926	1.07	1,537
April.....	66.0	36.0	49.0	1.810	2.02	2,916
May.....	102.0	34.0	54.0	2.000	2.31	3,320
June.....	102.0	40.0	62.0	2.300	2.57	3,689
July.....	79.0	11.5	29.0	1.070	1.23	1,783
August.....	18.2	5.2	8.8	0.326	0.38	541
September.....	7.8	4.0	5.0	0.185	0.21	298
October.....	7.5	4.5	5.6	0.207	0.24	344
The period.....	.....	.....	.....	.....	10.03	14,428

MEAN MONTHLY DISCHARGE in Second-feet of Canyon creek near Mountain Mill

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		20.0	4.6	3.4	15.0	14.9	5.6	10.6	654
November.....		22.0 ^b	6.1 ^c						
December.....									
January.....									
February.....									
March.....				2.1 ^e	7.0 ^f	25.0		25.0	1,537
April.....	49.0 ^a	44.0	76.0 ^d	23.0	21.0	49.0		34.0	2,043
May.....	87.0	32.0	51.0	24.0	98.0	54.0		58.0	3,541
June.....	52.0	14.4	19.7	12.7	76.0	62.0		39.0	2,349
July.....	10.0	13.1	6.9	6.0	32.0	29.0		16.2	994
August.....	13.0	5.4	3.9	3.1	16.3	8.8		8.4	517
September.....	81.0	3.5	2.5	3.4	12.1	5.0		17.9	1,062
Total in acre-feet.....	16,647	8,679	8,188	4,632	16,646	15,000			12,697

^a 10-30.^b 1-15.^c 1-15.^d 14-30.^e 17-31.^f 15-31

MILL CREEK NEAR MOUNTAIN MILL

Location.—On the SW. $\frac{1}{4}$ Sec. 18, Tp. 6, Rge. 1, W. 5th Mer.*Records available.*—July 7, 1910, to October 31, 1916.*Gauge.*—Vertical staff; elevation of zero maintained at 93.41 feet since establishment.*Bench-mark.*—Permanent iron bench-mark; assumed elevation 100.00 feet.*Channel.*—Coarse gravel.*Discharge measurements.*—By wading with meter at ordinary stages and from bridge at flood stages.*Winter flow.*—Station not maintained during the winter.*Observer.*—K. B. Parsons.

DISCHARGE MEASUREMENTS of Mill creek near Mountain Mill, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 22.....	J. M. Paul.....	34	33.1	2.72	1.93	90 ^g
April 12.....	do.....	42	41.4	2.90	2.03	120
May 13.....	W. M. Edwards.....	45	51.3	3.18	2.20	163
June 8.....	do.....	71	115.0	4.23	2.95	486
July 7.....	do.....	66	94.7	3.91	2.65	370
Aug. 5.....	do.....	37	30.4	1.98	1.69	60
Sept. 6.....	do.....	36	30.8	1.72	1.63	53
Nov. 22.....	do.....	45	23.0	1.04	2.30	24 ⁱ

ⁱ Stream frozen over.^g Ice going out.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Mill creek near Mountain Mill, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1			1.92	96	2.25	180	2.75	397
2			1.83	81	2.25	180	2.79	415
3			1.82	79	2.35	218	2.86	448
4			1.83	81	2.55	305	3.26	632
5			1.78	73	2.55	305	3.32	659
6			1.83	81	2.55	305	3.21	609
7			1.85	84	2.59	323	2.95	489
8			1.87	87	2.65	351	3.05	535
9			2.07	129	2.55	305	3.10	558
10			2.08	131	2.44	255	3.00	512
11			2.12	141	2.40	237	2.92	475
12			2.03	119	2.25	180	2.90	466
13			2.04	122	2.22	170	2.90	466
14			2.05	124	2.20	163	2.95	489
15			2.07	129	2.19	160	3.20	604
16			2.01	114	2.15	150	3.31	655
17			2.00	112	2.15	150	3.35	673
18			1.96	104	2.15	150	3.35	673
19			1.93	98	2.15	150	3.30	650
20			1.90	92	2.25	180	3.36	678
21			1.95	102	2.35	218	3.35	673
22	1.93	98	1.92	96	2.30	198	3.04	580
23	1.95	102	1.90	92	2.25	180	2.95	489
24	1.92	96	1.85	84	2.25	180	2.95	489
25	1.82	79	1.85	84	2.25	180	2.95	489
26	1.81	78	2.00	112	2.40	237	2.95	489
27	1.82	79	2.05	124	2.85	443	3.00	512
28	1.78	73	2.14	147	2.85	443	3.05	535
29	1.77	72	2.23	174	2.98	503	3.10	538
30	1.79	75	2.25	180	2.85	443	3.10	558
31	1.77	72			2.81	425		

DAILY GAUGE HEIGHT AND DISCHARGE of Mill creek near Mountain Mill, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-f
1	3.09	553	1.51	42	1.55	46	1.49	40
2	3.24	622	1.49	40	1.60	50	1.50	41
3	3.24	622	1.46	38	1.65	56	1.48	39
4	3.04	530	1.47	39	1.66	57	1.48	39
5	2.94	484	1.56	46	1.66	57	1.48	39
6	2.79	415	1.50	41	1.63	54	1.49	40
7	2.73	388	1.46	38	1.61	51	1.50	41
8	2.96	494	1.40	34	1.60	50	1.52	43
9	2.83	434	1.52	43	1.58	48	1.53	44
10	2.64	346	1.97	106	1.57	47	1.52	43
11	2.51	287	1.85	84	1.56	46	1.52	43
12	2.44	255	1.83	81	1.55	46	1.53	44
13	2.37	226	1.80	76	1.56	46	1.54	45
14	2.32	206	1.75	69	1.54	45	1.53	44
15	2.23	174	1.72	65	1.53	44	1.54	45
16	2.18	158	1.69	61	1.53	44	1.54	45
17	2.13	144	1.75	69	1.54	45	1.55	46
18	2.02	117	1.70	62	1.54	45	1.55	46
19	2.03	119	1.68	60	1.55	46	1.58	48
20	2.03	119	1.63	54	1.53	44	1.54	45
21	2.03	119	1.65	56	1.51	42	1.54	45
22	1.92	96	1.65	56	1.51	42	1.54	45
23	1.84	82	1.63	54	1.50	41	1.54	45
24	1.84	82	1.63	54	1.50	41	1.55	46
25	1.83	81	1.61	51	1.50	41	1.56	46
26	1.83	81	1.60	50	1.48	39	1.55	46
27	1.82	79	1.65	56	1.49	40	1.55	46
28	1.82	79	1.59	49	1.49	40	1.55	46
29	1.70	62	1.57	47	1.49	40	1.55	46
30	1.61	51	1.56	46	1.49	40	1.55	46
31	1.52	43	1.55	46	.....	.....	1.55	46

MONTHLY DISCHARGE of Mill creek near Mountain Mill, for 1916

(Drainage area 64 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (22-31)	102	72	82	1.280	0.48	1,626
April	180	73	109	1.700	1.90	6,486
May	503	150	254	3.970	4.58	15,618
June	678	397	547	8.550	9.54	32,549
July	622	43	243	3.800	4.38	14,941
August	106	34	55	0.859	0.90	3,382
September	57	39	46	0.719	0.80	2,737
October	48	39	44	0.688	0.79	2,705
The period					23.46	80,044

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of Mill creek near Mountain Mill

MONTH	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		98	99	42	72	162	108	44	89	5,491
November.....			195 ^b	52 ^g		121 ^d				
December.....										
January.....										
February.....										
March.....							82 ^f			
April.....		106	68		132 ^c	149 ^e	109		94	5,627
May.....		322	209	288	226	478	254		296	18,216
June.....		470	130	311	208	428	547		349	20,769
July.....	39.0 ^a	112	152	100	87	200	243		149	9,156
August.....	16.9	206	49	66	61	122	55		82	5,058
September.....	109.0	427	31	36	48	96	46		113	6,749
Total in acre-ft....	9,456	105,130	50,754	52,836	47,338	95,188	83,980			71,066

a 7-31.
b 1-15.
c 13-30.
d 1-3.
e 18-30.
f 22-31.
g 1-15.

CASTLE RIVER NEAR COWLEY

Location.—On the SW. $\frac{1}{4}$ Sec. 2, Tp. 7, Rge. 1, W. 5th Mer., at G. W. Buchanan's ranch.
Records available.—August 5, 1909, to December 31, 1916; discharge measurement only in 1908.

Gauge.—Open chain; elevation of zero maintained at 92.34 feet since establishment.

Bench-marks.—Permanent iron bench-mark; assumed elevation 100.00.

Channel.—Coarse gravel and not liable to shift.

Discharge measurements.—Made from the bridge at all stages, during open water.

Observer.—G. W. Buchanan.

DISCHARGE MEASUREMENTS of Castle river near Cowley, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 14.....	W. R. McCaffrey.....	90	101.0	1.20	3.93 ^b	122
Jan. 28.....	H. W. Rowley.....	55	69.3	1.70	3.85 ^b	118
Feb. 11.....	do.....	62	60.8	1.66	3.53 ^b	101
Feb. 23.....	J. E. Caughey.....	80	98.8	2.88	3.90 ^b	285
Mar. 20.....	J. M. Paul.....	75	126.0	4.08	2.49	514
April 10.....	do.....	107	255.0	3.09	2.81	787
May 10.....	W. M. Edwards.....	169	423.0	3.83	3.80	1,617
June 9.....	do.....	234	685.0	5.11	5.00	3,498
June 21.....	W. H. Hannan.....	268	1,083.0	6.24	6.68	6,762
June 23.....	do.....	246	718.0	5.55	5.39	3,984
June 29.....	do.....	248	760.0	5.87	5.50	4,427
July 11.....	W. M. Edwards.....	227	545.0	4.46	4.32	2,427
Aug. 4.....	do.....	108	218.0	2.53	2.56	552
Aug. 31.....	do.....	70	110.0	2.92	2.20	320
Oct. 18.....	E. J. Switzer.....	63	90.1	2.43	2.02	219
Nov. 24.....	W. M. Edwards.....	91	169.0	0.62	2.33 ^b	104
Dec. 11.....	do.....	80	89.0	1.34	2.69 ^b	118
Dec. 28.....	E. J. Switzer.....	62	69.9	1.40	2.76 ^b	97

b Ice conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Castle river near Cowley, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	4.05 <i>b</i>	150	3.55	115	3.57	208	2.45	480	3.29	1,184	3.95	1,900
2....	3.95	135	3.55	113	3.52	204	2.45	480	3.36	1,260	3.85	1,782
3....	3.95	120	3.58	112	3.57	202	2.45	480	3.44	1,334	4.35	2,418
4....	3.90	118	3.60	110	3.57	202	2.50	515	3.84	1,771	4.35	2,418
5....	3.90	122	3.55	109	3.67	201	2.48	501	4.25	2,285	5.05	3,527
6....	3.90	133	3.52	108	3.62	201	2.48	501	4.45	2,560	4.85	3,182
7....	3.90	135	3.58	106	3.57	203	2.52	529	4.65	2,860	4.65	2,860
8....	3.88	135	3.55	104	3.47	206	2.55	551	4.55	2,706	4.55	2,706
9....	3.95	131	3.50	103	3.77	209	2.55	551	3.85	1,782	5.03	3,491
10....	3.90	123	.....	102	4.05	210	2.80	745	3.83	1,759	5.35	4,073
11....	3.85	108	3.55	101	3.92	211	2.85	785	3.55	1,451	4.95	3,350
12....	3.88	104	3.55	119	3.67	213	2.90	825	3.45	1,345	4.65	2,860
13....	3.90	115	3.60	160	3.50	218	2.91	834	3.30	1,193	4.74	3,004
14....	3.91	122	3.78	310	3.12	220	2.91	834	3.20	1,099	4.95	3,350
15....	3.90	122	3.88	700	2.87	230	2.96	879	3.15	1,052	5.49	4,333
16....	3.95	123	4.38	940	2.80	242	3.00	915	3.15	1,052	6.27	5,907
17....	4.00	122	4.38	1,060	2.27	261	3.00	915	3.15	1,052	6.52	6,432
18....	3.98	122	4.38	1,100	2.27 <i>b</i>	315	2.97	888	3.20	1,099	6.52	6,432
19....	3.90	129	4.38	950	2.37	425	2.97	888	3.35	1,240	6.82	7,062
20....	3.95	132	4.08	440	2.48	501	2.87	801	3.40	1,292	6.44	6,264
21....	3.90	135	3.98	330	2.55	551	2.83	769	3.50	1,398	6.71	6,831
22....	3.90	134	3.88	300	2.50	515	2.75	705	3.45	1,345	5.86	5,060
23....	3.88	132	3.90	285	2.50	515	2.73	689	3.55	1,451	5.43	4,220
24....	3.85	130	4.02	270	2.50	515	2.73	689	3.45	1,345	5.06	3,545
25....	3.90	126	3.82	251	2.45	480	2.73	689	3.40	1,292	5.10	3,618
26....	.....	121	3.82	236	2.45	480	2.93	852	3.35	1,240	5.15	3,709
27....	.....	119	3.77	222	2.45	480	3.13	1,033	3.55	1,451	5.20	3,800
28....	3.85	118	3.67	215	2.40	445	3.34	1,231	3.85	1,782	5.53	4,410
29....	3.75	117	3.65	210	2.35	412	3.24	1,137	3.95	1,900	5.53	4,410
30....	3.60	117	.....	.....	2.32	392	3.19	1,090	3.85	1,782	5.18	3,764
31....	3.58	116	.....	.....	2.40	445	.....	.....	3.80	1,725	.....	.....

b-b lee conditions.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Castle river near Cowley, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	4.81	3,116	2.65	626	2.21	325	2.02	221	2.01	215	2.39	106
2....	5.38	4,128	2.55	551	2.25	349	2.02	221	2.02	221	2.44	109
3....	5.26	3,909	2.55	551	2.35	412	2.02	221	2.02	221	2.57	112
4....	4.89	3,248	2.56	558	2.60	588	2.02	221	2.05	237	2.54	115
5....	4.79	3,084	2.55	551	2.62	603	2.02	221	2.04	232	2.49	117
6....	4.49	2,618	2.55	551	2.55	551	2.02	221	2.02	221	2.34	119
7....	4.47	2,589	2.45	480	2.47	494	2.02	221	2.01	215	2.29	120
8....	4.52	2,661	2.45	480	2.38	432	2.01	215	1.96	192	2.24	120
9....	4.51	2,647	3.00	915	2.40	445	2.00	210	1.925	191	2.64	120
10....	4.52	2,661	2.80	745	2.36	419	2.00	210	1.93	185	.....	119
11....	4.32	2,377	2.75	705	2.33	399	1.98	201	2.50	180	2.69	118
12....	4.20	2,220	2.60	588	2.29	373	1.98	201	2.75	174	2.72	118
13....	4.15	2,155	2.56	558	2.27	361	1.98	201	3.01	166	2.73	120
14....	4.05	2,026	2.55	551	2.25	349	1.98	201	3.02	159	2.76	120
15....	3.75	1,669	2.55	551	2.24	343	1.95	187	2.98	150	2.73	119
16....	3.65	1,558	2.55	551	2.21	325	1.95	187	2.95	142	2.74	118
17....	3.60	1,504	2.65	626	2.20	319	2.00	210	2.86	136	2.73	117
18....	3.52	1,419	2.56	588	2.15	291	2.02	221	2.73	131	2.60	116
19....	3.38	1,271	2.50	515	2.12	275	2.00	210	2.48	128	2.67	115
20....	3.20	1,099	2.46	487	2.05	237	1.98	201	2.53	120	2.74	113
21....	3.10	1,005	2.40	445	2.05	237	1.98	201	2.61	114	2.54	111
22....	3.15	1,052	2.35	412	2.05	237	1.96	192	2.58	110	2.54	110
23....	3.10	1,005	2.30	379	2.05	237	1.94	183	2.33	106	2.79	109
24....	2.90	825	2.30	379	2.05	237	1.91	169	2.33	104	2.76	107
25....	2.95	870	2.30	379	2.05	237	1.92	174	2.42	104	2.74	102
26....	2.92	843	2.30	379	2.05	237	1.95	187	2.48	104	2.74	101
27....	2.92	843	2.25	349	2.05	237	2.01	215	2.48	103	2.77	98
28....	2.75	705	2.25	349	2.05	237	2.01	215	2.43	103	2.76	97
29....	2.75	705	2.25	349	2.02	221	2.01	215	2.42	103	2.75	97
30....	2.71	673	2.25	349	2.02	221	2.01	215	2.38	104	2.64	98
31....	2.70	665	2.20	319	.....	.....	2.01	215	.....	.....	2.62b	98

b-b Ice conditions.

MONTHLY DISCHARGE of Castle river near Cowley, for 1916

(Drainage area 348 square miles)

MONTH	DISCHARGE IN SECOND-FEET				Run-Off	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	150	104	125	0.359	0.41	7,686
February.....	1,100	101	320	0.919	0.99	18,407
March.....	551	201	326	0.937	1.08	20,045
April.....	1,231	480	759	2.180	2.43	45,164
May.....	2,860	1,052	1,551	4.460	5.14	95,345
June.....	7,062	1,782	4,024	11.560	12.90	239,388
July.....	4,128	665	1,843	5.300	6.11	113,295
August.....	915	319	510	1.470	1.70	31,359
September.....	603	221	341	0.979	1.09	20,291
October.....	221	174	206	0.592	0.68	12,666
November.....	237	103	156	0.448	0.50	9,243
December.....	120	97	112	0.322	0.37	6,887
The year.....	.....	.....	.....	.....	33.40	619,816

MEAN MONTHLY DISCHARGE in Second-feet of Castle river near Cowley

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		204	723	566	304	395	934	528	206	482	29,665
November.....				867	319	345	605	336	156	438	26,063
December.....				222	133	138	297	196	112	183	11,252
January.....			86	107	119	141	221	125		133	8,193
February.....			118	82	98	164	136	320		153	8,633
March.....			226	93	88	145	143	326		170	10,464
April.....		1,116	743	682	612	907	722	759		792	47,098
May.....		1,908	2,275	1,845	1,954	1,781	2,353	1,551		1,952	120,188
June.....		1,420	3,675	1,433	2,709	1,545	2,150	4,024		2,422	144,127
July.....			498	933	1,157	789	596	980		1,843	971
August.....		631 ^a	204	726	444	426	352	563		510	59,689
September.....		275	371	1,911	290	265	311	419		341	28,331
Total in Acre-ft.	50,142	346,006	688,707	472,047	472,288	412,158	577,006	656,490			524,816

^a 5-31.

PINCHER CREEK AT PINCHER CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 23, Tp. 6, Rge. 30, W. 4th Mer., in the town of Pincher Creek.*Records available.*—April 1, 1910, to October 31, 1916. Discharge measurements only; 1906-09.*Gauge.*—Vertical staff; elevation of zero maintained at 86.35 feet since establishment.*Bench-mark.*—On right concrete abutment of bridge; assumed elevation 100.00 feet.*Channel.*—Rock, gravel and gumbo.*Discharge measurements.*—Made from bridge and by wading.*Winter flow.*—Station not maintained during the winter.*Observer.*—Hugh Bertles.

DISCHARGE MEASUREMENTS of Pincher creek at Pincher Creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 20.....	J. M. Paul.....	46	44.2	1.95	2.91	86.0
April 10.....	do.....	48	43.0	1.98	2.96	85.0
May 10.....	W. M. Edwards.....	49	43.5	2.02	2.96	88.0
June 19.....	do.....	74	76.0	3.55	3.35	270.0
July 11.....	do.....	54	52.2	2.35	3.06	123.0
Aug. 4.....	do.....	35	19.8	1.30	2.42	26.0
Aug. 31.....	do.....	32	16.8	1.20	2.35	20.0
Oct. 13.....	E. J. Switzer.....	36	17.6	1.12	2.37	19.7
Nov. 24.....	W. M. Edwards.....	26	9.0	0.70	2.60	6.4

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Pincher creek at Pincher Creek, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			3.90	556	3.02	105	3.10	124	3.30	196
2.....			3.95	600	2.94	88	3.07	117	3.28	188
3.....			4.00	644	2.85	73	3.05	112	3.26	181
4.....			4.00	644	2.85	73	3.05	112	3.30	196
5.....			4.00	644	2.75	59	3.03	107	3.65	378
6.....			3.90	556	2.85	73	3.07	117	3.44	261
7.....			3.78	456	2.87	76	3.15	141	3.35	218
8.....			4.00	644	2.88	77	3.05	112	3.34	214
9.....			4.00	644	2.98	96	3.03	107	3.37	227
10.....				573	2.95	90	2.95	90	3.35	218
11.....				502	2.95	90	2.95	90	3.34	214
12.....				431	2.95	90	2.94	88	3.24	173
13.....				360	2.87	76	2.95	90	3.26	181
14.....				289	2.92	84	2.93	86	3.35	218
15.....				218	2.97	94	2.93	86	3.37	227
16.....	5.15	2,023		147	2.92	84	2.94	88	3.34	214
17.....	4.70	1,444	2.85	73	2.87	76	2.93	86	3.35	218
18.....	4.40	1,076	2.80	66	2.85	73	2.90	80	3.35	218
19.....	4.25	904	2.97	94	2.85	73	2.94	88	3.44	261
20.....	4.18	827	3.70	408	2.83	70	2.94	88	3.55	320
21.....	4.10	744	2.92	84	2.83	70	2.92	84	3.44	261
22.....	3.90	556	2.83	70	2.83	70	2.94	88	3.35	218
23.....	3.88	538	2.85	73	2.82	69	2.94	88	3.23	169
24.....	3.88	538	2.90	80	2.82	69	3.05	112	3.20	158
25.....	3.75	438	2.80	66	2.80	66	3.23	169	3.16	144
26.....	3.72	420	2.73	56	2.78	63	3.23	169	3.24	173
27.....	3.88	538	2.70	52	2.85	73	3.20	158	3.22	166
28.....	3.75	438	2.75	59	2.87	76	3.45	266	3.40	240
29.....	3.95	600	2.64	45	3.02	105	3.43	256	3.53	309
30.....			2.85	73	3.05	112	3.38	231	3.33	209
31.....			2.74	58			3.33	209		

DAILY GAUGE HEIGHT AND DISCHARGE of Pincher creek at Pincher Creek, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	3.23	169	2.45	28.0	2.37	22.0	2.30	16.0
2.....	3.68	396	2.43	26.0	2.36	21.0	2.32	17.6
3.....	3.45	266	2.41	25.0	2.43	26.0	2.37	2.20
4.....	3.35	218	2.42	26.0	2.65	46.0	2.38	22.0
5.....	3.23	169	2.43	26.0	2.63	44.0	2.40	24.0
6.....	3.15	141	2.41	25.0	2.54	35.0	2.43	26.0
7.....	3.15	141	2.39	23.0	2.53	34.0	2.43	26.0
8.....	3.13	134	2.37	22.0	2.50	32.0	2.40	24.0
9.....	3.11	127	2.98	96.0	2.45	28.0	2.40	24.0
10.....	3.07	117	2.82	69.0	2.41	25.0	2.43	26.0
11.....	3.01	102	2.68	50.0	2.42	26.0	2.42	26.0
12.....	2.97	94	2.62	42.0	2.44	27.0	2.42	26.0
13.....	2.97	94	2.60	40.0	2.43	26.0	2.41	25.0
14.....	2.91	82	2.62	42.0	2.42	26.0	2.41	25.0
15.....	2.85	73	2.55	36.0	2.40	24.0	2.38	22.0
16.....	2.83	70	2.45	28.0	2.40	24.0	2.38	22.0
17.....	2.81	67	2.50	32.0	2.36	21.0	2.42	26.0
18.....	2.80	66	2.61	41.0	2.35	20.0	2.42	26.0
19.....	2.74	58	2.54	35.0	2.34	19.2	2.40	24.0
20.....	2.73	56	2.52	34.0	2.33	18.4	2.40	24.0
21.....	2.68	50	2.46	29.0	2.31	16.8	2.45	28.0
22.....	2.65	46	2.45	28.0	2.30	16.0	2.44	27.0
23.....	2.65	46	2.44	27.0	2.30	16.0	2.45	28.0
24.....	2.61	41	2.42	26.0	2.30	16.0	2.45	28.0
25.....	2.60	40	2.40	24.0	2.30	16.0	2.45	28.0
26.....	2.63	44	2.42	26.0	2.29	15.4	2.45	28.0
27.....	2.60	40	2.43	26.0	2.30	16.0	2.52	34.0
28.....	2.56	37	2.37	22.0	2.30	16.0	2.54	35.0
29.....	2.51	35	2.34	19.2	2.28	14.8	2.45	28.0
30.....	2.50	32	2.31	16.8	2.27	14.2	2.44	27.0
31.....	2.48	30	2.35	20.0	.....	.....	2.43	26.0

MONTHLY DISCHARGE of Pincher Creek at Pincher creek, for 1916

(Drainage area 50 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (16-29).....	2,023	420.0	792	15.800	8.22	21,987
March.....	644	45.0	299	5.980	6.89	18,385
April.....	112	59.0	80	1.600	1.78	4,760
May.....	266	80.0	124	2.480	2.86	7,624
June.....	378	144.0	219	4.380	4.89	13,031
July.....	396	30.0	99	1.980	2.28	6,087
August.....	96	16.8	33	0.660	0.76	2,029
September.....	46	14.2	23	0.460	0.51	1,368
October.....	35	16.0	26	0.520	0.60	1,599
The period.....	.....	.....	.....	.....	28.79	76,870

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of Pincher creek at Pincher Creek

MONTH	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		53	92.0	21.0	27.0	73	69	26	52	3,175
November.....			34.0 ^b	24.0 ^d						
December.....										
January.....										
February.....							792 ^h			
March.....		40 ^a	103.0 ^c		17.2 ^f	52 ^g	299		299	18,385
April.....	22.00	42	67.0	146.0 ^e	58.0	55	80		54	3,206
May.....	61.00	219	88.0	141.0	100.0	231	124		135	8,290
June.....	46.00	209	59.0	128.0	69.0	341	219		153	9,106
July.....	82.00	51	70.0	44.0	28.0	168	99		77	4,116
August.....	1.92	66	18.2	28.0	21.0	94	33		37	2,297
September.....	40.00	308	10.9	13.4	18.0	58	23		67	4,006
Total in acre-feet..	10,843	58,088	26,053	30,774	20,157	64,087	79,514			52,581

a 19-31

b 1-15.

c 24-31.

d 1-15.

e 6-30.

f 12-31.

g 10-31.

h 16-29.

OLDMAN RIVER NEAR MACLEOD

Location.—On the NW. $\frac{1}{4}$ Sec. 10, Tp. 9, Rge. 26, W. 4th Mer., at the traffic bridge.

Records available.—July 10, 1910, to December 31, 1916.

Gauge.—Vertical staff. Zero of gauge maintained at 91.47 feet during 1913. Zero of gauge maintained at 87.67 feet during 1910, 1911, 1912, 1914, 1915 and 1916.

Steven's continuous water stage recorder, type A, was installed at this station during 1916, and set to same datum as the staff-gauge.

Bench-mark.—Permanent bench-mark established on concrete pier; assumed elevation 100.00 feet.

Channel.—Shifts slightly.

Discharge measurements.—Made with current-meter from traffic bridge.

Winter flow.—Records are obtained during the winter season 600 feet below the bridge.

Observer.—Mrs. W. A. Jackson.

DISCHARGE MEASUREMENTS of Oldman river, near Macleod, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 5.....	W. R. McCaffrey.....	100	294	1.34	5.80 ^b	394
Jan. 18.....	do.....	95	285	1.04	4.96 ^b	298
Feb. 1.....	H. W. Rowley.....	100	237	1.53	4.85 ^b	364
Feb. 16.....	do.....				6.77	.....^g
Feb. 22.....	do.....	103	362	3.54	3.86	1,282
Mar. 1.....	do.....	94	224	1.53	2.38	343
Mar. 4.....	do.....	110	448	1.07	5.12 ^b	479
Mar. 18.....	J. M. Paul.....	102	340	3.29	3.63	1,129
Mar. 29.....	do.....	103	342	3.13	3.53	1,081
April 21.....	do.....	109	404	4.21	4.15	1,700
April 29.....	W. M. Edwards.....	118	567	5.35	5.25	3,038
May 19.....	do.....	135	607	4.24	5.15	2,576
June 1.....	do.....	327	1,062	4.34	6.20	4,609
June 22.....	do.....	549	2,399	6.66	8.90	15,972
June 23.....	do.....	437	1,936	6.18	8.10	11,985
June 24.....	do.....	414	1,773	6.29	7.70	11,151
June 26.....	do.....	408	1,658	5.90	7.53	9,778
June 28.....	do.....	419	1,867	7.07	8.15	13,195
June 30.....	do.....	427	1,979	6.70	8.13	13,262
July 13.....	do.....	359	1,159	4.42	6.30	5,102
Aug. 10.....	do.....	126	578	3.62	4.66	2,092
Sept. 8.....	do.....	121	467	2.66	3.86	1,243
Oct. 11.....	E. J. Switzer.....	109	361	1.74	3.04	629
Oct. 30.....	W. M. Edwards.....	109	363	1.64	3.02	595
Nov. 29.....	do.....	106	306	1.28	2.78	391
Dec. 13.....	do.....	85	248	1.08	3.48 ^b	336
Dec. 30.....	E. J. Switzer.....	105	268	1.09	3.48 ^b	292

b Ice conditions.

g Ice going out; impossible to measure.

DAILY GAUGE HEIGHT AND DISCHARGE of Oldman River near Macleod, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	5.70 ^b	400	4.85	364	2.50	400	3.60	1,095	5.10	2,620	6.30	4,865
2....	5.60	397	4.85	367	4.85	1,200	3.75	1,200	5.15	2,690	6.30	4,865
3....	5.70	392	4.85	372	5.10	1,600	3.60	1,095	5.30	2,900	6.20	4,610
4....	5.80	390	4.85	380	4.90	1,800	3.50	1,025	6.00	4,140	6.40	5,135
5....	5.90	394	4.85	390	5.10	1,800	3.50	1,025	6.30	4,865	7.50	9,510
6....	5.90	410	4.85	400	5.10	1,600	3.45	990	6.60	5,730	7.40	9,025
7....	5.80	445	4.85	417	4.90	1,400	3.60	1,095	7.20	8,080	7.20	8,080
8....	5.80	441	4.85	431	4.70	1,200	3.80	1,240	6.70	6,065	7.15	7,860
9....	5.75	402	4.85	452	3.90	1,000	4.10	1,500	6.30	4,865	7.50	9,510
10....	5.70	340	4.82	475	5.10	2,000	4.20	1,600	5.80	3,740	7.80	11,030
11....	5.70	285	4.80	498	5.00	1,800	4.30	1,700	5.50	3,210	7.50	9,510
12....	5.60	276	4.75	560	5.20	1,600	4.30	1,700	5.30	2,900	7.30	8,545
13....	5.40	275	4.70	700	4.70	1,500	4.20	1,600	5.20	2,760	7.10	7,645
14....	5.25	276	4.60	900	4.10	1,200	4.15	1,550	5.15	2,690	7.50	9,510
15....	5.10	280	4.90 ^b	1,600	3.80	1,200	4.50	1,900	5.80	3,740	8.40	14,200
16....	5.00	288	9.88 ^g	8,000 ^e	3.70	1,000	4.60	2,000	5.00	2,480	8.90	17,040
17....	5.00	295	.....	7,000 ^e	3.60	900	4.40	1,800	4.95	2,415	9.00	17,640
18....	4.96	298	4.91	2,363	3.63	860	4.30	1,700	4.90	2,350	9.00	17,640
19....	4.90	300	4.76	2,182	3.63	860	4.20	1,600	5.05	2,550	9.17	18,682
20....	4.80	300	4.21	1,610	3.70	860	4.20	1,600	5.30	2,900	9.57	21,134
21....	4.70	305	3.95	1,365	4.05	900	4.15	1,550	5.50	3,210	9.63	21,502
22....	4.75	306	3.80	1,240	3.92	920	4.15	1,550	5.50	3,210	9.15	18,560
23....	4.80	311	3.58	1,081	3.75	900	4.15	1,550	5.50	3,210	8.00	12,060
24....	4.80	318	3.30	885	3.65	1,000	4.15	1,550	5.50	3,210	7.70	10,520
25....	4.80	322	3.50	1,025	3.50 ^g	900	4.10	1,500	5.50	3,210	7.50	9,510
26....	4.80	330	3.35	920	3.40	955	4.10	1,500	5.45	3,130	7.35	8,805
27....	4.80	335	3.10	745	3.45	990	4.10	1,500	5.43	3,098	7.60	10,010
28....	4.80	339	2.80	560	3.45	990	5.30	2,900	5.60	3,380	8.10	12,590
29....	4.80	345	3.12	759	3.53	1,046	5.20	2,760	6.20	4,610	8.30	13,660
30....	4.80	352	.....	.....	3.40	955	5.00	2,480	6.40	5,135	8.00	12,060
31....	4.85	360	.....	.....	3.40	955	.....	.....	6.40	5,135	.....	.....

b-b Ice conditions.*e* Discharge estimated.*g-g* Ice going out and on banks.



View showing the ice deposited on the right bank of Oldman river above the Canadian Pacific Railway bridge near Macleod during the break-up in February, 1916.
Taken on February 18, 1916, by J. E. Caughey.



Another view showing the ice deposited on the right bank of Oldman river above the Canadian Pacific Railway bridge near Macleod, during the break-up in February, 1916.
Taken on February 18, 1916, by J. E. Caughey.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Oldman River near Macleod, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	7.50	9,510	4.20	1,840	3.30	1,300	3.12	1,231	3.00	1,190	2.75	365
2....	8.00	12,060	4.10	1,765	3.30	1,300	3.15	1,242	3.00	1,190	2.80	355
3....	8.40	14,200	4.00	1,695	3.50	1,400	3.15	1,242	2.95	1,174	3.00	347
4....	8.20	13,120	4.00	1,695	3.80	1,565	3.12	1,231	2.90	1,158	2.80	342
5....	7.50	9,510	4.00	1,695	4.20	1,840	3.10	1,224	2.90	1,158	2.80	340
6....	7.20	8,140	3.90	1,625	4.10	1,765	3.10	1,224	2.90	1,158	2.75	340
7....	7.00	7,320	3.82	1,577	4.00	1,695	3.10	1,224	2.95	1,174	2.60	340
8....	6.95	7,130	3.80	1,565	3.86	1,601	3.10	1,224	2.97	1,180	2.25	340
9....	6.90	6,945	4.30	1,920	3.70	1,505	3.10	1,224	3.00	1,190	2.80	339
10....	6.83	6,695	4.66	2,261	3.65	1,475	3.05	1,206	3.10	1,224	2.95	338
11....	6.65	6,110	4.30	1,920	3.55	1,425	3.00	1,190	3.00	1,190	3.10	338
12....	6.40	5,385	4.00	1,695	3.50	1,400	3.00	1,190	2.30b	600	3.20	337
13....	6.30	5,125	4.00	1,695	3.50	1,400	3.00	1,190	2.50	600	3.48	336
14....	6.18	4,822	3.90	1,625	3.50	1,400	3.00	1,190	2.30	630	3.49	333
15....	5.85	4,075	3.72	1,517	3.45	1,375	3.00	1,190	2.30	660	3.52	330
16....	5.70	3,780	3.70	1,505	3.40	1,350	3.00	1,190	2.30	678	3.65	328
17....	5.56	3,523	3.70	1,505	3.35	1,325	3.00	1,190	3.30	682	3.62	325
18....	5.40	3,255	3.80	1,565	3.29	1,296	3.02	1,196	3.30	679	3.61	322
19....	5.35	3,175	4.00	1,695	3.25	1,280	3.05	1,206	3.20	664	3.59	320
20....	5.30	3,100	3.80	1,565	3.20	1,260	3.07	1,213	3.15	643	3.54	320
21....	5.30	3,100	3.72	1,517	3.15	1,242	3.10	1,224	3.10	620	3.48	318
22....	5.15	2,875	3.65	1,475	3.10	1,224	3.05	1,206	3.10	590	3.44	315
23....	4.90	2,545	3.60	1,450	3.00	1,190	3.00	1,190	2.95	555	3.40	310
24....	4.62	2,220	3.60	1,450	3.00	1,190	3.00	1,190	2.80	512	3.40	309
25....	4.60	2,200	3.57	1,435	3.00	1,190	3.00	1,190	2.80	478	3.40	305
26....	4.60	2,200	3.54	1,420	3.00	1,190	3.00	1,190	2.80	450	3.40	302
27....	4.50	2,100	3.52	1,410	3.05	1,206	3.05	1,206	2.75	420	3.35	300
28....	4.45	2,055	3.50	1,400	3.10	1,224	3.10	1,224	2.70	402	3.30	300
29....	4.40	2,010	3.45	1,375	3.10	1,224	3.10	1,224	2.78	391	3.40	295
30....	4.30	1,920	3.42	1,360	3.10	1,224	3.05	1,206	2.75	378	3.48	284
31....	4.25	1,880	3.30	1,300	.....	.....	3.00	1,190	.....	.....	3.48b	292

b-b Ice conditions.

MONTHLY DISCHARGE of Oldman river near Macleod, for 1916

(Drainage area 2,255 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	445	275	339	0.150	0.17	20,844
February.....	8,000	364	1,312	0.582	0.63	75,466
March.....	2,000	400	1,171	0.519	0.60	72,002
April.....	2,900	990	1,595	0.707	0.79	94,909
May.....	8,080	2,350	3,685	1.630	1.88	226,581
June.....	21,502	4,610	11,510	5.100	5.69	684,892
July.....	14,200	1,880	5,229	2.320	2.68	321,519
August.....	2,261	1,300	1,597	0.708	0.82	98,195
September.....	1,840	1,190	1,369	0.607	0.68	81,461
October.....	1,242	1,190	1,208	0.536	0.62	74,277
November.....	1,224	378	787	0.349	0.39	46,830
December.....	365	292	325	0.144	0.17	19,983
The year.....	.....	.....	.....	.....	15.12	1,816,959

MEAN MONTHLY DISCHARGE in Second-feet, of Oldman river near Macleod

MONTH	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		1,057	1,287	696	774	1,670	1,122	1,208	1,116	60,062
November			1,372	713	667	1,277	891	787	951	56,599
December			644	425	412	506	547	325	476	29,266
January			396	306	283	427	339		350	21,533
February			319	284	235	342	1,312		498	29,017
March		1,051	845	384	401	468	1,171		720	36,975
April		1,779	1,636	2,610	1,573	1,713	1,595		1,818	108,159
May		5,921	3,148	5,220	4,102	6,538	3,685		4,769	299,385
June		8,357	3,815	6,151	3,655	6,155	11,510		6,607	395,144
July	756a	1,971	2,999	1,811	1,511	3,311	5,229		2,805	172,493
August	461	2,080	1,214	1,158	768	1,645	1,597		1,275	78,366
September	624	4,060	732	765	674	948	1,369		1,310	79,234
Total in acre-ft.	95,436	1,543,688	1,095,694	1,239,740	911,003	1,527,342	1,831,510			1,366,233

a 12-31.

CARMICHAEL DITCH NEAR STAVELY

Location.—On the SE. $\frac{1}{4}$ Sec. 34, Tp. 13, Rge. 29, W. 4th Mer.*Records available.*—Partial records for 1912 and 1913.*Gauge.*—Vertical staff.*Bench-mark.*—On post, at elevation of 4.51 feet above zero of gauge.*Discharge measurements.*—Made by weir.*Observer.*—J. Carmichael.*Remarks.*—No records were received for 1916, but the inspecting engineer reports that a little water was used during June and part of July.

TROUT CREEK AT LOCKWOOD'S RANCH

Location.—On SE. $\frac{1}{4}$ Sec. 32, Tp. 11, Rge. 28, W. 4th Mer.*Records available.*—July 7, 1911, to October 31, 1916.*Gauge.*—Vertical staff; elevation 90.30 during 1911; elevation 92.19 during 1912-16.*Bench-mark.*—Permanent iron bench-mark; assumed elevation 100.00 feet.*Channel.*—Composed of gravel.*Discharge measurements.*—Made with current-meter by wading.*Winter flow.*—Station not maintained during winter.*Observer.*—Mrs. G. P. Stewart.

DISCHARGE MEASUREMENTS of Trout creek at Lockwood's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 30	J. M. Paul	15	9.60	1.15	6.44	11
May 1	W. M. Edwards	29	25.80	2.26	3.30	58
May 22	do	28	27.20	1.97	3.40	54
June 19	do	34	58.90	3.67	4.32	216
July 21	do	29	33.60	2.58	3.54	87
Aug. 18	do	24	45.90	1.63	3.37	75
Sept. 18	do	30	26.80	2.13	3.19	57
Oct. 28	do	28	22.40	2.01	3.19	45

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Trout creek at Lockwood's ranch, for 1916

DAY	May		June		July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	3.29	59	4.85	369	3.90	134	3.27	57	3.05	37	3.14	45
2....	3.30	60	4.92	393	4.18	186	.....	56e	3.05	37	3.16	46
3....	3.30	60	5.10	456	4.07	164	3.25	55	3.60	91	3.16	46
4....	3.34	64	5.42	576	3.98	147	3.24	54	4.02	154	3.14	45
5....	3.36	66	5.82	738	3.98	147	3.27	57	3.58	89	3.25	55
6....	3.40	70	5.60	648	3.95	142	3.22	52	3.42	72	3.20	50
7....	3.39	69	5.50	608	3.94	140	3.20	50	3.36	66	3.16	46
8....	3.39	69	5.39	564	4.00	150	3.20	50	3.34	64	3.12	43
9....	3.41	71	5.34	545	3.98	147	3.46	76	3.33	63	3.10	41
10....	3.40	70	5.26	515	3.92	137	3.37	67	3.31	61	3.10	41
11....	3.40	70	5.04	434	3.93	139	3.28	58	3.30	60	3.09	40
12....	3.42	72	4.92	393	3.86	128	3.25	55	3.27	57	3.09	40
13....	3.41	71	4.80	352	3.80	118	3.21	51	3.28	58	3.09	40
14....	3.40	70	4.70	320	3.70	104	3.19	49	3.26	56	3.09	40
15....	3.38	68	4.54	273	3.69	103	3.15	46	3.25	55	3.09	40
16....	3.35	65	4.41	239	3.68	101	3.15	46	3.24	54	3.09	40
17....	3.40	70	4.34	222	3.64	96	3.15	46	3.23	53	3.09	40
18....	3.36	66	4.36	226	3.68	101	3.37	67	3.19	49	3.12	43
19....	3.36	66	4.30	212	3.60	91	3.24	54	3.18	48	3.14	45
20....	3.33	63	4.48	257	3.57	88	3.18	48	3.18	48	3.14	45
21....	3.33	63	4.26	203	3.54	84	3.17	47	3.16	46	3.13	44
22....	3.40	70	4.16	182	3.53	83	3.14	45	3.15	46	3.13	44
23....	3.52	82	4.12	174	3.51	81	3.13	44	3.15	46	3.14	45
24....	3.58	89	4.10	170	3.50	80	3.10	41	3.15	46	3.15	46
25....	3.62	94	4.06	162	3.52	82	3.14	45	3.14	45	3.15	46
26....	3.60	91	4.05	160	3.54	84	3.12	43	3.14	45	3.15	46
27....	3.57	88	4.04	158	3.50	80	3.10	41	3.14	45	3.15	46
28....	3.72	107	4.18	186	.....	76e	3.08	39	3.14	45	3.15	46
29....	4.06	162	4.06	162	3.42	72	3.06	38	3.13	44	.....	38e
30....	4.79	349	3.98	147	3.32	62	3.05	37	3.12	43	2.98	31
31....	4.72	326	.....	.....	3.32	62	3.05	37	.....	.....	3.00	33

No records prior to May in 1916.

e Discharge estimated.

MONTHLY DISCHARGE of Trout creek at Lockwood's ranch, for 1916

(Drainage area 164 square miles)

MONTH	DISCHARGE IN SECOND-FeET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
May.....	349	59	92	0.561	0.65	5,657
June.....	738	147	335	2.040	2.28	19,934
July.....	186	62	110	0.671	0.77	6,764
August.....	76	37	50	0.304	0.35	3,074
September.....	154	37	57	0.347	0.39	3,392
October.....	55	31	43	0.262	0.30	2,644
The period.....	.....	.....	.....	.....	4.74	41,465

MEAN MONTHLY DISCHARGE in Second-feet of Trout creek at Lockwood's ranch

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		15.0	1.24 ^b	54	23.0	17.3	10.7	32	43	28.0	1,710
November					22.0 ^j						
December											
January											
February											
March			13.6							13.6	135
April		8.20 ^b	12.5	43 ^c	78.0 ^e	34.0	26.0			24.0	1,432
May	196.0 ^a	6.20 ^c	26.0	61	97.0	19.3	206.0	92		84.0	5,136
June	137.0	1.07 ^d	36.0	71	82.0	16.9	312.0	335		141.0	8,422
July	63.0	0.20 ^e	19.4	69	82.0	16.1	250.0	110		87.0	5,360
August	29.0	0.20 ^f	72.0	44	35.0	10.2	97.0	50		48.0	2,972
September	15.0	2.80 ^g	111.0	26	10.2	5.8	45.0	57		39.0	2,359
Total in Acre-ft.	21,749	1,371	16,884	21,415	24,005	7,226	57,449	40,789			27,526

a 14-31.

b 8 days.

c 13 days.

d 19 days.

e 12 days.

f 12 days.

g 19 days.

h 11 days.

i 12-30.

j 1-15.

k 13-30.

Records.—May, 1908, to October, 1911, at Stevenson's ranch, SE. 12-12-28-4. April, 1912, to October, 1914, at Lockwood's ranch, SE. 32-11-28-4.

MUDDYPOUND CREEK AT HART'S RANCH

Location.—On the SW $\frac{1}{4}$ Sec. 27, Tp. 11, Rge. 28, W. 4th Mer., at the foot-bridge on L. O. Hart's ranch.

Records available.—July 27, 1908, to November 22, 1916.

Gauge.—Vertical staff.

Zero maintained at elevation of 91.06 feet during 1908-1911.

Zero maintained at elevation of 90.06 feet during 1912-1916.

Bench-mark.—Permanent iron bench-mark, thirty-five feet northeast of gauge; assumed elevation 100.00 feet.

Channel.—Not liable to shift.

Discharge measurements.—Made by current-meter from bridge at high water, and by wading at low water.

Observer.—Mrs. M. E. Hart.

DISCHARGE MEASUREMENTS of Muddypound creek at Hart's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 30	J. M. Paul	6	2.40	1.29	2.10	3.1
May 1	W. M. Edwards	8	5.30	1.75	2.30	9.3
May 22	do	8	4.10	1.72	2.24	7.1
June 19	do	10	7.00	3.50	2.78	24.5
July 21	do	8	6.10	2.04	2.41	12.5
Aug. 18	do	8	6.15	2.03	2.33	12.5
Sept. 18	do	7	3.40	1.69	2.20	5.8
Oct. 28	do	10	3.90	1.65	2.19	6.4

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Muddypound creek at Hart's ranch, for 1916

DAY	February		March*		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			5.10	40.0e	2.38	11.6	2.28	8.5	3.10	35.0
2.....			5.10	40.0e	2.30	9.1	2.24	7.3	3.05	34.0
3.....			5.10	40.0e	2.30	9.1	2.20	6.1	3.05	34.0
4.....			5.10	40.0e	2.30	9.1	2.20	6.1	3.05	34.0
5.....			5.00	40.0e	2.30	9.1	2.20	6.1	3.10	35.0
6.....			5.00	40.0e	2.30	9.1	2.20	6.1	3.10	35.0
7.....			5.00	40.0e	2.30	9.1	2.20	6.1	3.10	35.0
8.....			5.00	40.0e	2.34	10.3	2.20	6.1	3.10	35.0
9.....			5.28	42.0e	2.28	8.5	2.20	6.1	3.10	35.0
10.....			5.98	48.0e	2.27	8.2	2.20	6.1	3.08	35.0
11.....			5.58	45.0e	2.25	7.6	2.20	6.1	3.07	34.0
12.....			4.73	40.0e	2.24	7.3	2.20	6.1	3.06	34.0
13.....			4.53	39.0e	2.23	7.0	2.20	6.1	3.02	33.0
14.....			4.23	38.0e	2.22	6.7	2.20	6.1	2.88	28.0
15.....			3.98	35.0e	2.25	7.6	2.20	6.1	2.80	25.0
16.....			3.98	35.0e	2.24	7.3	2.20	6.1	2.80	25.0
17.....			3.98	35.0e	2.21	6.4	2.20	6.1	2.80	25.0
18.....			3.18	32.0e	2.20	6.1	2.20	6.1	2.80	25.0
19.....			3.08	30.0e	2.20	6.1	2.20	6.1	2.80	25.0
20.....			2.38b	8.0e	2.20	6.1	2.20	6.1	2.80	25.0
21.....			2.16	4.9	2.20	6.1	2.20	6.1	2.80	25.0
22.....			2.16	4.9	2.19	5.8	2.21	6.4	2.78	24.0
23.....	5.19b	40e	2.16	4.9	2.19	5.8	2.22	6.7	2.74	23.0
24.....	5.19	40e	2.16	4.9	2.19	5.8	2.38	11.6	2.72	22.0
25.....	5.19	40e	2.41	12.5	2.19	5.8	2.45	13.8	2.68	21.0
26.....	5.17	40e	2.26	7.9	2.19	5.8	2.39	11.9	2.64	19.9
27.....	5.15	40e	2.26	7.9	2.19	5.8	2.34	10.3	2.66	21.0
28.....	5.15	40e	2.26	7.9	2.20	6.1	2.77	24.0	2.75	24.0
29.....	5.15	40e	2.26	7.9	2.24	7.3	2.60	18.6	2.66	21.0
30.....			2.13	4.0	2.26	7.9	3.05	34.0	2.62	19.2
31.....			2.48	14.8			3.05	34.0		

b-b Ice conditions.

e Discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Muddypound creek at Hart's ranch, for 1916.
—Concluded.

DAY	July		August		September		October		November	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.	2.60	18.6	2.24	7.30	2.05	1.60	2.21	6.4	2.19	5.80
2.	3.19	38.0	2.24	7.30	2.05	1.60	2.22	6.7	2.19	5.80
3.	2.72	22.0	2.25	7.60	2.24	7.30	2.23	7.0	2.18	5.50
4.	2.62	19.2	2.25	7.60	2.90	29.00	2.24	7.3	2.18	5.50
5.	2.59	18.3	2.34	10.30	2.50	15.40	2.25	7.6	2.18	5.50
6.	2.54	16.7	2.23	7.00	2.40	12.20	2.25	7.6	2.18	5.50
7.	2.50	15.4	2.23	7.00	2.40	12.20	2.25	7.6	2.17	5.20
8.	2.50	15.4	2.23	7.00	2.50	15.40	2.25	7.6	2.16	4.90
9.	2.50	15.4	3.41	12.50	2.50	15.40	2.25	7.6	2.12	3.70
10.	2.46	14.1	2.70	22.00	2.35	10.60	2.25	7.6	2.00	1.00
11.	2.46	14.1	2.35	10.60	2.30	9.10	2.25	7.6	2.00	1.00
12.	2.46	14.1	2.30	9.10	2.25	7.60	2.24	7.3	2.10	3.10
13.	2.50	15.4	2.30	9.10	2.25	7.60	2.24	7.3	2.15	4.60
14.	2.42	12.8	2.27	8.20	2.22	6.70	2.23	7.0	2.20	6.10
15.	2.42	12.8	2.25	7.60	2.20	6.10	2.22	6.7	2.20	6.10
16.	2.42	12.8	2.25	7.60	2.20	6.10	2.21	6.4	2.20	6.10
17.	2.52	16.0	2.25	7.60	2.20	6.10	2.22	6.7	2.20	6.10
18.	2.72	22.0	2.32	9.70	2.20	6.10	2.24	7.3	2.20	6.10
19.	2.45	13.8	2.28	8.50	2.20	6.10	2.28	8.5	2.20	6.10
20.	2.40	12.2	2.25	7.60	2.20	6.10	2.25	7.6	2.20	6.10
21.	2.40	12.2	2.23	7.00	2.20	6.10	2.24	7.3	2.20	6.10
22.	2.40	12.2	2.20	6.10	2.20	6.10	2.23	7.0	2.20	6.10
23.	2.35	10.6	2.16	4.90	2.20	6.10	2.24	7.3	.....	.....
24.	2.35	10.6	2.12	3.70	2.20	6.10	2.24	7.3	.....	.....
25.	2.35	10.6	2.10	3.10	2.20	6.10	2.25	7.6	.....	.....
26.	2.42	12.8	2.05	1.60	2.20	6.10	2.25	7.6	.....	.....
27.	2.31	9.4	2.00	1.00	2.20	6.10	2.25	7.6	.....	.....
28.	2.30	9.1	2.00	1.00	2.20	6.10	2.20	6.1	.....	.....
29.	2.30	9.1	2.00	1.00	2.20	6.10	2.20	6.1	.....	.....
30.	2.28	8.5	2.00	1.00	2.20	6.10	2.20	6.1	.....	.....
31.	2.26	7.9	2.00	1.00	.....	.....	2.19	5.8	.....	.....

MONTHLY DISCHARGE of Muddypound creek at Hart's ranch, for 1916

(Drainage area 44 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (23-29)	40.0	40.00	40.0	0.909	0.24	555
March	48.0	4.90	27.0	0.614	0.71	1,660
April	11.6	5.80	7.5	0.170	0.19	446
May	34.0	6.10	9.8	0.223	0.26	603
June	35.0	19.20	28.0	0.636	0.71	1,666
July	38.0	7.90	14.6	0.332	0.38	898
August	22.0	1.00	6.9	0.157	0.18	424
September	29.0	1.60	8.3	0.189	0.21	494
October	8.5	5.80	7.1	0.161	0.19	437
November (1-22)	6.1	1.00	5.1	0.116	0.09	222
The period	.....	.....	.....	.....	3.16	7,405

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of Muddypound creek at Hart's ranch

MONTH	1907-8	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		6.3	3.70	1.41	10.4	2.90	1.78	4.1	7.6	7.1	5.0	310
November					6.8 _d	4.60				5.1 _g	4.6	147
December												
January												
February									40.0 _f			
March				8.10 _c				17.2 _e	27.0		27.0	1,660
April		19.2 _b	3.60	3.10	12.8	10.60	6.90	6.5	7.5		7.3	398
May		36.0	2.50	5.30	7.1	6.40	1.75	18.3	9.8		10.9	667
June		30.0	0.55	2.30	7.8	8.70	1.00	35.0	28.0		14.2	841
July	23.0 _a	18.5	Nil	0.79	9.8	4.40	0.05	33.0	14.6		10.1	624
August	14.6	9.7	Nil	8.90	5.4	2.40	0.23	21.0	6.9		7.7	472
September	8.2	4.1	0.30	24.00	4.1	1.25	0.28	9.1	8.3		6.6	397
Total in Acre-ft.	1,621	6,857	647	2,973	3,627	2,109	722	8,253	7,213			5,516

a 27-31.
b 17-30.
c 20-21.
d 1-11.
e 16-31.
f 23-29.
g 1-22.

WILLOW CREEK NEAR MACLEOD

Location.—On the NE. $\frac{1}{4}$ Sec. 20, Tp. 9, Rge. 26, W. 4th Mer.

Records available.—August 13, 1915, to December 31, 1916.

Gauge.—Vertical staff; zero elevation 89.65.

Bench-mark.—Permanent iron bench-mark set in 1916; assumed elevation 100.00 feet.

Channel.—One channel except at very high stages; clean gravel and sand bottom.

Discharge measurements.—Made from bridge, except at low water.

Observer.—Miss B. Connolly.

DISCHARGE MEASUREMENTS of Willow creek near Macleod, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 4.	W. R. McCaffrey	49	99.4	0.33	1.33 _b	32.0
Jan. 17.	do	28	28.8	0.25	1.23 _b	7.3
Feb. 1.	H. W. Rowley	35	25.0	0.42	1.90 _b	10.4
Feb. 15.	do	70	26.0	0.88	2.74 _b	23.0
Feb. 29.	do	129	195.0	0.29	2.53 _c	57.0
Mar. 4.	do	155	97.0	0.48	2.29 _c	47.0
Mar. 17.	J. M. Paul	72	134.0	1.98	1.79	265.0
Mar. 29.	do	68	133.0	1.68	1.68	223.0
April 21.	do	73	128.0	1.60	1.60	205.0
May 20.	W. M. Edwards	75	146.0	1.71	1.71	249.0
June 2.	do	132	422.0	4.21	3.44	1,773.0
June 25.	do	119	272.0	3.61	2.56	982.0
June 24.	do	118	267.0	3.35	2.46	895.0
June 29.	do	134	445.0	4.99	3.53	2,224.0
July 14.	do	110	212.0	2.41	2.16	511.0
Aug. 11.	do	106	190.0	2.11	2.00	412.0
Sept. 9.	do	104	182.0	1.80	1.88	327.0
Oct. 11.	E. J. Switzer	75	139.0	1.65	1.65	224.0
Oct. 30.	W. M. Edwards	73	144.0	1.52	1.59	219.0
Nov. 28.	do	140	190.0	0.84	1.75 _b	159.0
Dec. 15.	do	54	78.0	1.37	1.80 _b	107.0
Dec. 30.	E. J. Switzer	33	64.3	0.86	1.75 _b	55.0

b Ice conditions.

c Gauge height affected by backwater from ice jam.

DAILY GAUGE HEIGHT AND DISCHARGE of Willow creek near Macleod, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	1.33 ^b	46.0	1.90	10.4	2.53	55	1.55	184	1.30	92	2.96	1,446
2	1.43	42.0	1.90	10.4	2.45	52	1.70	250	1.30	92	2.98	1,466
3	1.53	37.0	1.90	10.4	2.53	47	1.75	274	1.20	60	2.97	1,453
4	1.33	32.0	1.90	11.0	.....	47	1.75	274	1.25	76	2.96	1,440
5	1.38	35.0	2.00	12.0	2.46	47	1.73	264	1.40	125	3.07	1,585
6	1.63	45.0	2.05	12.0	2.46	49	1.66	232	1.60	205	2.96	1,440
7	1.68	49.0	2.10	13.0	2.46	53	1.65	227	1.55	184	2.91	1,375
8	1.68	45.0	2.00	14.0	1.73	57	1.57	192	1.80	298	2.91	1,375
9	1.53	31.0	2.00	15.0	1.13	64	1.55	184	1.75	274	3.06	1,572
10	Dry	23.0	2.05	17.0	1.13	71	1.55	184	1.75	274	3.41	2,054
11	"	15.0	2.05	18.0	1.13	83	1.50	163	1.65	227	2.96	1,440
12	"	9.0	2.05	19.0	.....	100	1.55	184	1.50	163	2.97	1,453
13	"	5.0	2.10	20.0	.....	122	1.56	188	1.51	167	2.96	1,440
14	"	2.0	2.15 ^b	22.0	.....	141	1.57	192	1.50	163	2.91	1,375
15	"	3.0	2.74	23.0	.....	177	1.67	237	1.55	184	2.90	1,362
16	"	5.0	3.31	30.0	.....	215	1.75	274	1.49	159	2.86	1,311
17	1.23	7.3	3.15	280.0	1.80	298	1.75	274	1.49	159	2.91	1,375
18	1.75	8.0	3.18	303.0	1.85	326	1.65	227	1.50	163	2.61	1,004
19	1.80	9.0	0.33	260.0	1.79	293	1.58	197	1.48	155	2.66	1,064
20	1.70	9.0	0.23	190.0	1.85	326	1.55	184	1.71	255	2.74	1,161
21	1.65	10.0	0.23	130.0	1.87	336	1.60	205	1.46	148	2.74	1,161
22	1.65	10.0	Dry	90.0	1.79	293	1.60	205	1.81	304	2.70	1,112
23	1.60	10.0	1.73	77.0	1.65	227	1.70	250	1.96	389	2.59	980
24	1.80	10.0	1.83	71.0	1.65	227	1.80	298	1.96	389	2.36	722
25	2.00	9.0	1.78	68.0	1.55	184	1.79	293	2.06	457	2.31	672
26	2.00	8.0	1.73	65.0	1.50	163	1.72	260	2.16	537	2.40	762
27	2.05	8.0	2.73	62.0	1.45	144	1.63	219	2.16	537	2.46	830
28	2.10	9.0	2.68	60.0	1.55	184	1.50	163	2.16	537	2.55	934
29	2.15	9.0	2.53	57.0	1.68	241	1.50	163	2.16	537	2.51	888
30	2.20	9.0	.....	.....	1.73	264	1.60	205	2.76	1,186	2.76	1,186
31	2.00	10.0	.....	.....	1.65	227	.....	.....	2.96	1,440	.....	.....

b-b Ice conditions.

MONTHLY DISCHARGE of Willow creek near Macleod, for 1910-11

(Drainage area 1,013 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
1910						
April	45.0	35.00	41.0	0.040	0.04	2,440
May	68.0	35.00	53.0	0.052	0.06	3,259
June	35.0	7.50	23.0	0.023	0.03	1,369
July	7.5	1.10	3.2	0.003	0.00	197
August	4.3	0.90	2.7	0.003	0.00	166
September	82.0	5.20	47.0	0.040	0.05	2,797
October	70.0	24.00	48.0	0.047	0.05	2,951
The period					0.23	13,179
1911						
March (22-31)	292	65	185	0.183	0.07	3,669
April	131	34	77	0.076	0.08	4,582
May	881	64	211	0.208	0.24	12,974
June	460	93	199	0.197	0.22	11,841
July	144	42	72	0.071	0.08	4,427
August	1,312	48	309	0.305	0.35	19,000
September	1,413	113	515	0.508	0.57	30,645
October	253	48	136	0.134	0.15	8,362
November (1-15)	174	81	136	0.134	0.08	4,045
The period					1.84	99,545

NOTE—These tables are inserted in this report to correct tables which were published on pages 64 of the report for 1910 and 103 of the report for 1911.

SESSIONAL PAPER No. 258

DAILY GAUGE HEIGHT AND DISCHARGE of Willow creek near Macleod, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	2.76	1.186	1.60	205	1.40	125	1.59	201	1.66	232	1.79	155
2.....	2.80	1.235	1.50	163	1.35	108	1.65	227	1.53	176	1.77	154
3.....	2.81	1.248	1.45	144	1.40	125	1.67	237	1.54	180	1.77	153
4.....	2.76	1.186	1.43	136	1.30	92	1.68	241	1.65	227	1.79	153
5.....	2.66	1.064	1.45	144	2.20	570	1.58	197	1.65	227	1.82	152
6.....	2.56	946	1.40	125	2.10	487	1.70	250	1.67	237	1.80	151
7.....	2.51	888	1.35	108	2.00	413	1.84	320	1.58	197	1.75	148
8.....	2.46	830	1.30	92	1.95	383	1.75	274	1.58	197	1.73	144
9.....	2.55	934	1.90	353	1.90	353	1.69	246	1.69	246	1.73	139
10.....	2.46	830	2.00	413	1.85	326	1.66	232	1.796	244	1.70	132
11.....	2.36	722	2.00	413	1.80	298	1.66	232	1.29	236	1.70	125
12.....	2.26	625	1.90	353	1.76	279	1.68	241	1.69	212	1.70	120
13.....	2.16	537	1.50	163	1.70	250	1.65	227	1.99	199	1.80	115
14.....	2.16	537	1.40	125	1.65	227	1.64	223	2.01	201	1.75	110
15.....	2.00	413	1.35	108	1.65	227	1.63	218	1.29	204	1.80	107
16.....	1.90	353	1.40	125	1.65	227	1.66	232	2.05	205	1.80	104
17.....	1.80	298	1.50	163	1.65	227	1.71	255	2.10	203	1.86	100
18.....	1.90	353	1.59	201	1.53	176	1.74	269	2.10	198	1.86	97
19.....	1.95	383	1.59	201	1.45	144	1.72	260	2.08	189	1.87	93
20.....	1.90	353	1.50	163	1.65	227	1.77	284	2.01	184	1.87	90
21.....	2.00	413	1.50	163	1.60	205	1.76	279	2.02	179	1.88	88
22.....	1.95	383	1.45	144	1.50	163	1.82	309	2.02	175	2.43	85
23.....	1.90	353	1.40	125	1.48	155	1.76	279	2.02	172	2.43	81
24.....	1.80	298	1.45	144	1.45	144	1.73	264	2.01	170	2.44	78
25.....	1.85	326	1.40	125	1.40	125	1.72	260	2.00	168	2.44	73
26.....	1.85	326	1.45	144	1.45	144	1.69	246	1.98	166	2.48	69
27.....	1.80	298	1.52	101	1.50	163	1.74	269	1.90	163	2.65	65
28.....	1.75	274	1.50	163	1.55	184	1.72	260	1.78	159	2.65	62
29.....	1.70	250	1.45	144	1.55	184	1.64	223	1.78	156	2.65	58
30.....	1.65	227	1.40	125	1.57	192	1.59	201	1.74	155	1.95	55
31.....	1.50	163	1.40	125	.....	.....	1.69	246	.....	.....	1.956	53

b-b Ice conditions.

MONTHLY DISCHARGE of Willow creek near Macleod, for 1916

(Drainage area 1,006 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	49	2.0	18.0	0.018	0.02	1,107
February.....	303	10.4	68.0	0.068	0.07	3,911
March.....	336	47.0	165.0	0.164	0.19	10,145
April.....	298	163.0	222.0	0.221	0.25	13,210
May.....	1,440	60.0	320.0	0.318	0.36	19,676
June.....	2,054	672.0	1,248.0	1.240	1.38	74,261
July.....	1,248	163.0	588.0	0.584	0.67	36,155
August.....	413	92.0	174.0	0.173	0.20	10,690
September.....	570	92.0	231.0	0.230	0.26	13,745
October.....	309	197.0	248.0	0.246	0.28	15,249
November.....	246	155.0	195.0	0.194	0.22	11,603
December.....	155	55.0	107.0	0.106	0.12	6,579
The year.....	.....	.....	.....	.....	4.02	216,331

MEAN MONTHLY DISCHARGE in Second-feet of Willow creek near Macleod

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		41.0	48	136	121	85	125	189	248	124	7,632
November				136 ^f	115 ^b			140	195	168	9,967
December								106	107	106	6,548
January								18		18	1,107
February								68		68	3,911
March			185 ^h			65 ^d	207 ^e	165		165	10,145
April		41.0	77	256 ^a	490 ^c	182	130	222		130	7,760
May		53.0	211	305	397	156	994	320		348	21,398
June		23.0	199	381	317	151	1,609	1,248		561	33,398
July	295	3.2	72	493	300	91	1,226	588		384	23,585
August	134	2.7	309	285	187	31	543	174		208	12,794
September	44	47.0	515	137	92	22	286	231		172	10,225
Total in acre-ft. . .	28,998	12,771	90,089	115,440	112,850	45,119	302,180	209,370			148,466

- a 20-30.
- b 1-15.
- c 7-31.
- d 19-31.
- e 22-31.
- f 1-15.
- h 22-31.

Records.—July 1909 to Aug. 1915 on SE. 26-9-26-4. Sept. 1915 to Dec. 1916 on NE. 20-9-26-4.

OLDMAN (BELLY) RIVER NEAR LETHBRIDGE

Location.—On the traffic bridge on the NW. $\frac{1}{2}$ Sec. 1, Tp. 9, Rge. 22, W. 4th Mer.

Records available.—August 31, 1911, to December 31, 1916.

Gauge.—Chain gauge; elevation of zero maintained at 87.82 feet during 1911-12; 85.70 feet during 1913-16.

Bench-mark.—Top of arrow marked with white paint on the right abutment; assumed elevation 100.00 feet.

Discharge measurements.—Made from downstream side of the traffic bridge.

Winter flow.—Obtained through the ice one-half mile below the traffic bridge.

Observer.—Wm. Bedster.

DISCHARGE MEASUREMENTS of Oldman river near Lethbridge, in 1916

DATE	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq.-ft.</i>	<i>Ft. per sec</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 7	W. H. Storey	304	1,294	0.61	3.73 ^b	790
Feb. 3	V. A. Newhall	159	863	0.81	3.64 ^b	698
Feb. 20	H. W. Rowley	421	2,327	3.20	5.73	7,446
Mar. 9	do	301	1,349	1.83	3.14	2,464
Mar. 28	J. M. Paul	353	1,672	1.86	3.66	3,104
April 27	do	372	1,784	1.96	3.99	3,498
May 18	W. M. Edwards	414	2,281	2.49	5.00	5,678
June 16	do	594	4,416	4.89	8.97	21,592
June 21	J. E. Degnan	651	6,271	7.00	11.24	43,895
June 22	do	652	6,459	6.56	11.49	42,398
June 25	do	613	4,823	5.68	8.98	27,381
June 27	do	611	4,615	5.44	8.76	25,129
July 1	do	625	4,752	6.12	9.91	29,063
July 19	W. M. Edwards	590	2,878	3.85	6.72	11,086
Aug. 15	do	391	1,700	2.43	4.20	4,228
Sept. 12	do	371	1,589	2.28	4.00	3,615
Oct. 7	J. R. Estey	344	1,165	1.64	2.90	1,905
Oct. 20	F. J. Switzer	336	1,106	1.64	2.75	1,821
Nov. 13	W. M. Edwards	288	555	0.63	1.13	350
Dec. 6	H. W. Rowley	209	862	1.13	2.24	976
Dec. 27	do	315	1,038	0.73	3.70 ^b	754

b Ice conditions.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Oldman river near Lethbridge, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	3.03b	960	3.52	695	2.90	1,970	3.72	3,102	5.03	5,672	7.20	12,800
2....	3.00	940	3.52	695	2.44	1,460	4.18	3,884	5.15	5,965	7.04	12,160
3....	.....	915e	3.51	698	1.58	684	4.10	3,740	5.30	6,360	6.92	11,680
4....	.....	880e	3.50	700	1.89	932	3.98	3,536	5.53	7,008	7.20	12,800
5....	.....	845e	3.54	705	2.01	1,039	3.85	3,315	5.78	7,720	7.70	14,840
6....	3.54	815	3.57	710	2.44	1,460	3.86	3,332	6.22	9,148	8.84	20,736
7....	3.88	790	3.58	725	2.90	1,970	3.82	3,264	6.60	10,480	8.71	19,940
8....	3.93	760	3.60	740	3.42	2,650	3.80	3,230	6.30	9,420	7.98	16,104
9....	3.94	720	3.59	770	3.16	2,298	3.79	3,214	6.28	9,352	8.00	16,200
10....	4.02	710	3.62	800	3.80	3,230	3.92	3,434	6.25	9,250	8.20	17,160
11....	3.95	715	3.63	850	5.02	5,648	4.15	3,830	6.24	9,216	8.80	20,480
12....	3.84	725	3.63	960	6.75	11,020	4.13	3,794	5.98	8,336	8.44	18,408
13....	3.70	745	3.90	1,700	6.10	8,740	4.12	3,776	5.72	7,540	8.11	16,728
14....	3.64	770	4.18	2,060	5.00	5,600	4.12	3,776	5.50	6,920	8.23	17,316
15....	3.66	800	4.76	2,300	4.49	4,451	4.28	4,064	5.37	6,556	8.47	18,564
16....	3.69	830	5.58b	2,660	4.31	4,118	4.50	4,470	5.22	6,144	8.97	21,596
17....	3.62	860	8.79g	12,000	4.14	3,812	4.38	4,244	5.08	5,792	9.95	29,320
18....	3.54	890	7.85g	10,000	3.99	3,553	4.24	3,992	5.14	5,940	10.25	32,060
19....	3.52	905	6.60g	9,000	3.84	3,298	4.19	3,902	5.17	6,015	10.66	35,936
20....	3.54	915	5.73	7,570	3.88	3,366	4.18	3,884	5.20	6,090	11.40	43,040
21....	3.53	910	5.11	5,865	4.00	3,570	4.14	3,812	5.50	6,920	11.39	42,944
22....	3.50	880	4.68	4,838	4.00	3,570	4.11	3,758	5.52	6,976	11.25	41,600
23....	3.53	800	4.50	4,470	4.02	3,604	3.96	3,502	5.60	7,200	10.18	31,416
24....	3.58	760	4.38	4,244	3.92	3,434	3.97	3,519	5.78	7,720	9.34	24,240
25....	3.53	740	3.71	3,086	3.81	3,247	3.89	3,383	6.32	9,488	8.80	20,480
26....	3.49	730	3.44	2,680	3.68	3,040	3.92	3,434	6.71	10,876	8.82	20,608
27....	3.44	710	3.37	2,578	3.60	2,920	3.98	3,536	6.60	10,480	8.92	21,256
28....	3.39	715	3.37	2,578	3.66	3,010	4.20	3,920	6.60	10,480	9.54	25,840
29....	3.45	705	3.35	2,550	3.61	2,935	4.50	4,470	6.73	10,948	10.55	34,880
30....	3.54	700	.....	.....	3.59	2,905	4.92	5,408	6.90	11,600	10.40	33,460
31....	3.53	700	.....	.....	3.56	2,860	.....	.....	7.10	12,400	.....	.....

b-b Ice conditions.

g Ice going out.

e Discharge estimated from winter hydrograph.

DAILY GAUGE HEIGHT AND DISCHARGE of Oldman river near Lethbridge, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	9.83	28,264	4.54	4,550	3.47	2,725	2.72	1,762	2.58	1,608	2.14	1,160
2....	9.80	28,000	4.45	4,375	3.43	2,665	2.75	1,795	2.55	1,575	2.17	1,190
3....	9.89	28,792	4.33	4,154	3.87	3,349	2.81	1,862	2.52	1,542	2.05	1,075
4....	9.62	26,488	4.28	4,064	4.53	4,530	2.95	2,030	2.53	1,553	1.95	985
5....	9.59	26,240	4.19	3,902	5.23	6,171	2.98	2,066	2.60	1,630	2.01	1,039
6....	8.59	19,224	4.12	3,776	5.04	5,696	2.97	2,054	2.62	1,652	2.24	1,260
7....	8.20	17,160	4.01	3,587	4.84	5,216	2.99	2,078	2.60	1,630	2.00	1,030
8....	8.01	16,248	3.93	3,451	4.77	5,048	2.91	1,982	2.59	1,619	1.97	1,003
9....	7.95	15,960	4.60	4,670	4.66	4,796	2.90	1,970	1.90	940	1.91	949
10....	8.00	16,200	4.63	4,733	4.25	4,010	2.83	1,886	1.71	788	1.81	868
11....	7.94	15,912	4.62	4,712	4.05	3,655	2.78	1,828	1.68	764	1.73	804
12....	7.70	14,840	4.60	4,670	4.00	3,570	2.72	1,762	1.65	740	1.65	740
13....	7.55	14,200	4.55	4,570	3.83	3,281	2.71	1,751	1.13	351	1.65	740
14....	7.34	13,360	4.28	4,064	3.75	3,150	2.68	1,718	1.40	540	1.64	732
15....	7.12	12,480	4.12	3,776	3.69	3,055	2.68	1,718	1.63	724	2.10	1,120
16....	6.90	11,600	4.03	3,621	3.60	2,920	2.71	1,751	2.15	1,170	3.55	2,845
17....	6.72	10,912	4.02	3,604	3.51	2,785	2.71	1,751	2.29	1,310	3.70	3,070
18....	6.95	11,800	4.18	3,884	3.47	2,725	2.72	1,762	2.56	1,586	3.79	3,214
19....	6.72	10,912	4.15	3,830	3.32	2,508	2.71	1,751	2.66	1,696	3.88	3,366
20....	6.44	9,904	4.16	3,848	3.20	2,350	2.68	1,718	2.70	1,740	3.95	3,485
21....	6.20	9,080	4.19	3,902	3.13	2,259	2.65	1,685	2.72	1,762	.....^b	980 ^e
22....	5.98	8,336	4.14	3,812	3.09	2,207	2.76	1,806	2.70	1,740	.....	960 ^e
23....	5.66	7,368	3.97	3,519	3.01	2,103	2.75	1,795	2.63	1,663	3.70	930
24....	5.52	6,976	3.90	3,400	2.95	2,030	2.80	1,850	2.56	1,586	3.71	870
25....	5.45	6,780	3.87	3,349	2.96	2,042	2.70	1,740	2.53	1,553	3.78	810
26....	5.37	6,556	3.82	3,264	3.00	2,090	2.68	1,718	2.46	1,480	3.81	770
27....	5.28	6,306	3.78	3,198	2.95	2,030	2.68	1,718	2.40	1,420	3.70	754
28....	5.14	5,940	3.74	3,134	2.88	1,946	2.70	1,740	2.36	1,380	.....	740 ^e
29....	4.93	5,432	3.69	3,055	2.84	1,898	2.71	1,751	2.28	1,300	.....	735 ^e
30....	4.82	5,168	3.63	2,965	2.77	1,817	2.65	1,685	2.19	1,210	3.63	730
31....	4.66	4,796	3.49	2,755	.....	.....	2.63	1,663	.....	.....	3.60 ^b	730

^{b-b} Ice conditions.^e Discharge estimated from winter hydrograph.

SESSIONAL PAPER No. 25B

MONTHLY DISCHARGE of Oldman river near Lethbridge, for 1916

(Drainage area 6,764 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Persquare Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	960	700	801	0.118	0.14	49,240
February.....	12,000	695	3,077	0.455	0.49	176,949
March.....	11,020	684	3,432	0.507	0.58	210,975
April.....	5,408	3,102	3,751	0.554	0.62	223,147
May.....	12,400	5,672	8,194	1.210	1.40	503,710
June.....	43,040	11,680	23,486	3.480	3.88	1,397,182
July.....	28,792	4,796	13,588	2.010	2.32	835,295
August.....	4,733	2,755	3,813	0.564	0.65	234,397
September.....	6,171	1,817	3,154	0.466	0.52	187,631
October.....	2,078	1,663	1,811	0.268	0.31	111,328
November.....	1,762	351	1,342	0.198	0.22	79,836
December.....	3,485	730	1,280	0.189	0.22	78,685
The year.....					11.35	4,088,375

MEAN MONTHLY DISCHARGE in Second-feet of Oldman river near Lethbridge

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		2,836	1,636	2,121	3,999	3,591	1,811	2,666	163,844
November.....		2,135	a1,856	1,786	2,995	2,095	1,342	2,071	116,429
December.....		1,672		904	1,094	984	1,240	1,179	59,041
January.....		964	618	671	916	801		794	48,819
February.....		896	412	622	722	3,077		1,146	65,202
March.....		1,806	451	1,122	1,962	3,432		1,755	107,810
April.....		3,610	5,114	3,412	3,475	3,751		3,872	230,413
May.....		7,886	9,384	8,606	10,500	8,194		8,914	548,010
June.....		7,883	15,725	7,928	14,438	23,486		13,892	826,533
July.....		6,792	6,087	3,799	9,165	13,588		7,886	484,841
August.....		2,953	3,487	1,923	5,107	3,813		3,457	212,494
September.....		8,788	1,625	1,952	1,616	3,154		3,408	202,764
Total in acre-ft...	522,894	2,385,850	2,810,103	2,089,000	3,494,816	4,224,493			3,066,200

a 1-27

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Oldman river drainage basin, in 1916

Date	Engineer	Stream	Location	Width	Area of Section	Mean Velocity	Discharge
				Feet	Sq. ft.	Ft. per sec.	Sec.-ft.
Jan. 27.	H. W. Rowley	Bellevue creek	SE. 29-7-3-5				0.68w
Feb. 8.	do	do	do				0.64w
Feb. 25.	do	do	do				0.95w
Mar. 14.	do	do	do				1.25w
Mar. 24.	J. M. Paul	do	do				1.20w
June 5.	W. M. Edwards	do	do				1.46w
July 3.	do	do	do				1.09w
Aug. 1.	do	do	do				Nil w
Aug. 29.	do	do	do				0.60w
Nov. 17.	do	do	do				0.53w
Dec. 6.	V. A. Newhall	do	do				0.60w
Dec. 21.	E. J. Switzer	do	do				0.57w
Feb. 10.	W. H. Rowley	Blairmore creek	SE. 10-8-4-5	7.0	4.30	0.40	1.72
Feb. 24.	do	do	do	9.0	6.60	0.76	5.00
Mar. 13.	do	do	do	10.0	9.20	1.26	11.60
Mar. 23.	J. M. Paul	do	do	15.0	10.30	1.62	16.70
April 14.	do	do	do	25.5	21.60	1.97	42.00
June 6.	W. M. Edwards	do	do	27.0	25.90	2.82	73.00
July 4.	do	do	do	27.0	26.80	2.95	79.00
Aug. 2.	do	do	do	21.0	10.20	0.99	10.10
Aug. 30.	do	do	do	18.0	8.10	0.77	6.30
Nov. 16.	do	do	do	9.0	2.55	0.75	1.92
Dec. 7.	do	do	do	8.0	3.70	0.61	2.30
Dec. 22.	E. J. Switzer	do	do	8.0	2.55	0.61	1.55
Jan. 12.	W. R. McCaffrey	Drum creek	NW. 18-7-3-5	9.0	3.30	0.58	1.90
Feb. 8.	H. W. Rowley	do	do	6.5	1.55	0.77	1.19
Feb. 25.	do	do	do	9.0	2.60	0.96	2.50
Mar. 14.	do	do	do	10.0	3.60	1.44	5.20
Mar. 24.	J. M. Paul	do	do	9.5	3.17	1.22	3.90
May 9.	W. M. Edwards	do	do	14.0	11.00	1.55	17.10
June 5.	do	do	do	15.0	18.10	1.43	26.00
July 3.	do	do	do	13.0	9.15	1.58	14.40
Aug. 1.	do	do	do	10.5	4.17	1.20	5.00
Aug. 29.	do	do	do	11.0	2.70	0.82	2.20
Nov. 17.	do	do	do	8.0	2.25	0.72	1.61
Dec. 6.	do	do	do	9.0	2.00	0.84	1.67
Dec. 21.	E. J. Switzer	do	do	8.0	1.60	0.76	1.21
Jan. 27.	H. W. Rowley	Gold creek	NE. 30-7-3-5	22.0	29.00	0.76	22.00
Feb. 25.	do	do	do	22.0	15.80	1.06	16.80
Mar. 14.	do	do	do	22.0	19.80	1.16	23.00
Mar. 24.	J. M. Paul	do	do	22.0	18.50	1.24	23.00
May 9.	W. M. Edwards	do	do	23.0	28.80	2.83	81.00
June 5.	do	do	do	23.0	30.60	3.28	100.00
July 3.	do	do	do	23.5	34.80	4.02	140.00
Aug. 1.	do	do	do	22.0	20.60	1.80	37.00
Aug. 29.	do	do	do	22.0	14.20	1.57	22.00
Nov. 17.	do	do	do	22.0	14.90	1.16	17.30
Dec. 6.	do	do	do	23.0	15.80	1.12	17.70
Feb. 25.	H. W. Rowley	Lyons creek	NE. 35-7-4-5	10.0	5.60	0.93	5.20
Mar. 14.	do	do	do	17.0	20.70	1.20	25.00
Mar. 24.	J. M. Paul	do	do	10.0	7.90	1.95	15.40
June 5.	W. M. Edwards	do	do	21.0	26.00	3.25	84.00
July 3.	do	do	do	20.5	17.10	2.57	44.00
Aug. 1.	do	do	do				Nil
Aug. 29.	do	do	do				Nil
Nov. 17.	do	do	do				Nil
Feb. 9.	H. W. Rowley	Nez Percé creek	NW. 17-8-4-5	3.7	1.60	0.42	0.67
Mar. 13.	do	do	do	6.0	2.10	0.56	1.18
Mar. 23.	J. M. Paul	do	do	5.0	2.50	1.12	2.80
May 9.	W. M. Edwards	do	do	14.5	11.40	2.83	32.00
June 6.	do	do	do	14.0	11.50	2.63	30.00
July 4.	do	do	do	15.0	11.60	2.30	27.00
Aug. 2.	do	do	do	6.0	6.10	0.42	2.57
Aug. 30.	do	do	do	4.0	1.55	1.43	2.20
Nov. 16.	do	do	do	1.5	0.38	1.68	0.64
Dec. 22.	E. J. Switzer	do	do	2.0	0.92	0.39	0.36
Jan. 27.	H. W. Rowley	York creek	NW. 34-7-4-5				0.15e
Feb. 24.	do	do	do	8.0	4.0	0.88	3.50
Mar. 13.	do	do	do	12.0	8.50	1.44	12.20
Mar. 23.	J. M. Paul	do	do	18.0	8.60	1.02	8.80
April 14.	do	do	do	23.0	19.30	2.38	46.00
June 6.	W. M. Edwards	do	do	26.0	24.20	3.54	86.00
July 3.	do	do	do	26.5	28.30	3.80	108.00
Aug. 2.	do	do	do	18.0	12.20	1.52	18.60
Aug. 30.	do	do	do	14.0	8.60	0.92	8.00
Nov. 16.	do	do	do				Nil
Dec. 7.	do	do	do				Nil

NOTE.—w Discharge determined by using an 18-inch weir.

e Discharge estimated.

WATERTON RIVER DRAINAGE BASIN

General Description

Waterton river rises in the northwestern portion of the state of Montana, on the eastern slope of the Rocky mountains. It flows in a northerly direction and, passing through a chain of lakes near the international boundary, known as Waterton lakes, it continues in a north and easterly direction and finally empties into Belly river near Stand Off, Alberta.

The topography of the basin is of a varied character ranging from the mountainous regions of Montana to the rolling prairie of Southern Alberta. The tributaries are mostly in the upper portion of the basin, near the international boundary and from the west side.

There is a large snowfall in the upper portion of the basin, and the melting of this combined with heavy rains often causes floods on this river in the early summer. Thereafter the river steadily decreases in volume, until the minimum is reached about mid-winter.

The names of the principal tributaries of this stream are the Little Kootenay, which rises in Montana and empties into the south end of the Waterton lake; Boundary creek, and East Boundary creek, two small streams emptying into the upper Waterton lake from the west and east slopes, are south of the international boundary; Hell Roaring creek is a small stream in Canada flowing into the upper Waterton lake from the east slope; Bertha creek is a small tributary mostly snow fed, from the west slope of the upper lake and originating solely in Canada; Cameron, or Oil creek as it is called locally, has its head in Cameron lake, a body of water divided by the international boundary; Blakiston brook, a stream locally called Pass creek, rises wholly in Canada and is a steady source of supply to the waters of the Waterton river; Crooked creek drains the north-east slope of Sheep mountain and the nearby foot-hills until it flows into the Waterton river, one mile below the lakes on the east slope; Pine creek, Yarrow creek and Drywood river are the chief tributaries of the river system from foot-hills on the west slope.

Waterton lakes offer a very favourable site for a storage reservoir, approximately fourteen miles long and one mile wide. The steep, rocky banks of the narrows is an ideal site for the construction of a dam. The flow could be more than doubled during the late summer months and used for irrigation purposes, or a small power project could easily be developed.

CAMERON CREEK AT WATERTON PARK

Location.—On the SW. $\frac{1}{4}$ Sec. 23, Tp. 1, Rge. 30, W. 4th Mer., at Waterton Park.

Records available.—January 1 to December 31, 1916.

Gauge.—Vertical staff, maintained at elevation 95.97 feet to March 8; at 90.76-4,215.88 above mean sea-level to June 15, on vertical staff, and to November 10, on chain gauge; November 11 to December 31, on winter vertical staff, maintained at 4,218.08. Gauge read by C. S. Danielson.

Bench-mark.—Permanent iron; elevation maintained at 4,227.24 feet above mean sea-level.

Channel.—Permanent.

Discharge measurements.—At low stages by wading; at high stages from cable.

Winter flow.—Obtained through the ice at cable.

DISCHARGE MEASUREMENTS of Cameron creek at Waterton park, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 2	W. H. Storey	26.5	11.7	1.65	0.40 _b	19.3
Jan. 27	V. A. Newhall	18.0	11.0	1.47	0.07 _b	16.1
Mar. 10	do	21.5	30.5	0.93	1.68 _x	29.0
Mar. 28	S. H. Frame	28.0	28.3	1.14	1.19	32.0
April 19	do	24.0	31.3	1.60	1.41	50.0
May 20	do	44.0	66.9	2.18	2.10	146.0
June 10	do	50.0	106.0	4.20	3.00	445.0
June 12	do	49.0	94.4	3.29	2.66	309.0
July 8	do	51.0	84.0	3.88	2.72	326.0
July 31	do	42.0	38.2	1.90	1.69	72.0
Aug. 26	do	32.0	30.8	1.77	1.56	54.0
Sept. 14	do	38.0	31.6	1.67	1.51	53.0
Oct. 5	do	27.0	18.5	0.96	1.20 _x	17.7
Dec. 1	H. W. Rowley	20.0	25.6	0.82	0.26 _b	21.0
Dec. 21	do	18.0	14.0	1.08	0.10 _b	15.2

b Ice conditions.

x New gauge 100 feet down stream.

DAILY GAUGE HEIGHT AND DISCHARGE of Cameron creek at Waterton Park, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	.....^b	19.0 _e	0.07	16.1	0.07	16.0	1.12	19.2	1.84	94	2.00	123
2....	0.40	19.3 _d	0.07	16.1	0.07	16.0	1.10	18.0	2.14	152	2.20	166
3....	0.30	18.3	0.06	16.0	0.07	16.0	1.10	18.0	2.32	197	2.44	231
4....	0.10	16.4	0.05	15.9	0.07	16.0	1.10	18.0	2.50	250	2.95	424
5....	0.08	16.2	0.05	15.9	0.08	16.5	1.07	16.5	2.63	296	3.00	446
6....	0.07	16.1	0.04	15.8	0.09	16.8	1.05	15.5	2.75	342	2.50	250
7....	0.07	16.1	0.04	15.8	0.15	19.0	1.12	19.2	2.88	395	2.40	219
8....	0.05	15.9	0.03	15.7	0.24 _x	20.0 _e	1.21	25.0	2.90	403	2.78	353
9....	0.05	15.9	0.03	15.7	.....	24.0	1.28	30.0	2.50	250	3.05	468
10....	0.05	15.9	0.01	15.5	1.68	29.0 _d	1.32	34.0	2.00	123	3.10	491
11....	0.06	16.0	0.02	15.6	1.50	50.0	1.35	36.0	1.85	96	2.85	382
12....	0.10	16.4	0.04	15.8	1.70	74.0	1.35	36.0	1.75	81	2.60	285
13....	0.07	16.1	0.06	16.0	1.70	74.0	1.35	36.0	1.70	74	2.80	361
14....	0.07	16.1	0.42	19.5	1.40	40.0	1.35	36.0	1.66	69	3.00	446
15....	0.06	16.0	0.82	26.0	1.20	24.0	1.38	38.0	1.62	64	3.35	611
16....	0.06	16.0	0.60 _b	21.0	1.20	24.0	1.54	54.0	1.60	61	3.60	745
17....	0.05	15.9	8.07 _g	120.0	1.19	23.0	1.48	48.0	1.56	57	3.70	800
18....	0.05	15.9	6.10 _g	100.0	1.17	22.0	1.43	43.0	1.70	74	3.75	828
19....	0.04	15.8	3.04	90.0	1.18	23.0	1.41	41.0	1.95	114	3.40	636
20....	0.03	15.7	1.06	80.0	1.20	24.0	1.39	39.0	2.10	143	3.10	491
21....	0.04	15.8	0.50	50.0	1.27	30.0	1.37	38.0	2.18	161	3.05	468
22....	0.02	15.6	0.04	12.0	1.25	28.0	1.37	38.0	2.10	143	3.01	450
23....	0.01	15.5	0.00	5.0	1.30	32.0	1.30	32.0	2.00	123	2.94	420
24....	0.01	15.5	-0.04	4.0	1.25	28.0	1.27	30.0	1.98	119	2.90	403
25....	0.01	15.5	-0.07	3.0	1.22	26.0	1.30	32.0	1.95	114	2.90	403
26....	0.02	15.6	0.01	6.0	1.20	24.0	1.43	43.0	1.95	114	3.00	446
27....	0.05	15.9	0.04	12.0	1.20	24.0	1.56	57.0	2.00	123	3.03	460
28....	0.06	16.0	0.07	16.0	1.19	23.0	1.70	74.0	2.12	148	3.37	621
29....	0.08	16.2	0.07	16.0	1.29	31.0	1.92	108.0	2.25	178	3.22	547
30....	0.07	16.1	.....	.....	1.20	24.0	1.88	101.0	2.19	164	3.03	460
31....	0.08	16.2	.....	.....	1.15	21.0	.....	.....	2.10	143	.....	.....

b-b Ice conditions.

d Actual measurement.

e-e Discharge estimated from notes and discharge measurements.

g-g Ice jam.

x-x New gauge 100 feet down stream.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Cameron creek at Waterton Park, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	2.84	378	1.68	71	1.41	41	1.15	21.0	1.16	22.0	0.26	21.00
2....	2.87	390	1.68	71	1.39	39	1.11	18.6	1.16	22.0	0.24	20.00
3....	2.94	420	1.67	70	1.46	46	1.10	18.0	1.14	20.0	0.19	18.80
4....	2.79	357	1.62	64	2.29	188	1.18	23.0	1.13	19.8	0.20	19.20
5....	2.71	326	1.58	59	2.11	145	1.20	24.0	1.13	19.8	0.22	20.00
6....	2.66	307	1.56	57	2.00	123	1.21	25.0	1.15	21.0	0.24	21.00
7....	2.63	296	1.52	52	1.89	102	1.23	26.0	1.14	20.0	0.24	21.00
8....	2.76	345	1.71	75	1.77	84	1.20	24.0	1.14	20.0	0.23	20.00
9....	2.74	338	1.71	75	1.73	78	1.17	22.0	1.15	21.0	0.57	34.00
10....	2.73	334	1.71	75	1.68	71	1.13	19.8	1.18	23.0	1.05	53.00
11....	2.59	282	1.68	71	1.63	65	1.11	18.6	1.70 ^b	79.0	0.30	29.00
12....	2.66	307	1.62	64	1.57	58	1.12	19.2	1.70	79.0	0.24	21.00
13....	2.66	307	1.55	56	1.53	53	1.08	17.0	1.50	71.0	0.17	18.00
14....	2.59	282	1.53	53	1.51	51	1.09	17.5	1.00	51.0	0.18	18.40
15....	2.46	238	1.51	51	1.46	46	1.12	19.2	0.50	31.0	0.16	17.60
16....	2.29	188	1.49	49	1.43	43	1.12	19.2	0.46	29.0	0.14	16.80
17....	2.26	181	1.55	56	1.42	42	1.14	20.0	0.35	25.0	0.14	16.80
18....	2.21	168	1.67	70	1.41	41	1.12	19.2	0.28	22.0	0.14	16.80
19....	2.17	159	1.67	70	1.41	41	1.12	19.2	1.10	55.0	0.14	16.80
20....	2.11	145	1.63	65	1.42	42	1.15	21.0	1.10	55.0	0.12	16.00
21....	2.04	131	1.58	59	1.40	40	1.18	23.0	0.89	47.0	0.10	15.20
22....	1.96	121	1.55	56	1.40	40	1.20	24.0	0.59	35.0	0.28	22.00
23....	1.94	112	1.52	52	1.40	40	1.20	24.0	0.38	26.0	0.20	19.20
24....	1.89	102	1.47	47	1.39	39	1.23	26.0	0.30	23.0	0.14	16.80
25....	1.86	98	1.44	44	1.39	39	.....	26.0 ^e	0.29	23.0	0.10	15.20
26....	1.82	91	1.56	57	1.38	38	.....	26.0 ^e	0.27	21.0	0.06	9.00
27....	1.79	87	1.53	53	1.38	38	.....	25.0 ^e	0.24	20.0	0.05	7.50
28....	1.78	85	1.52	52	1.39 ^x	39	1.21	25.0	0.21	19.6	0.04	6.00
29....	1.77	84	1.49	49	.....	33 ^e	1.23	26.0	0.22	20.0	0.02	3.00
30....	1.70	74	1.46	46	.....	27 ^e	1.21	25.0	0.25	21.0	0.01	1.50
31....	1.69	73	1.42	42	.....	.....	1.18	23.0	.....	.....	0.00 ^b	1.00

^{b-b} Ice conditions, Nov. 11 to Dec. 31.^e Discharge estimated.

Winter staff gauge reduced to chain gauge height, Oct. 1 to Nov. 11.

Winter staff gauge heights, Nov. 11 to Dec. 31, discharge estimated from measurements.

MONTHLY DISCHARGE of Cameron creek at Waterton Park, for 1916

(Drainage area 27 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Persquare Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	19.3	15.50	16.2	0.600	0.69	996
February.....	120.0	3.00	27.0	1.000	1.08	1,553
March.....	74.0	16.00	28.0	1.040	1.20	1,722
April.....	108.0	15.50	39.0	1.440	1.61	2,321
May.....	403.0	57.00	157.0	5.810	6.70	9,654
June.....	828.0	123.00	448.0	16.590	18.51	26,658
July.....	420.0	73.00	220.0	8.150	9.40	13,527
August.....	75.0	42.00	59.0	2.180	2.51	3,628
September.....	188.0	27.00	59.0	2.180	2.43	3,511
October.....	26.0	17.00	22.0	0.815	0.94	1,353
November.....	79.0	19.60	32.0	1.180	1.32	1,904
December.....	53.0	1.00	21.0	0.778	0.90	1,291
The year.....	.....	.....	.....	.....	47.29	68,118

WATERTON RIVER NEAR WATERTON PARK

(Formerly called "Waterton river at Waterton Mills")

Location.—On the NE. $\frac{1}{4}$ Sec. 8, Tp. 2, Rge. 29, W. 4th Mer., near Waterton Mills.*Records available*.—August 26, 1908, to December 31, 1916.*Gauge*.—Vertical staff. Zero of gauge maintained at 4,153.07 feet during 1908-1912. Zero gauge maintained at 4,152.87 feet during 1913-16.*Remarks*.—Waterton Mills P.O. has been closed and gauging station is now near Waterton Park P.O.*Bench-mark*.—Permanent iron bench-mark, located within six feet of the gauge, elevation 4,162.56 feet above mean sea-level (Irrigation Surveys datum).*Channel*.—Composed of rocks, stone and gravel; not liable to shift.*Discharge measurements*.—Made from a cable car at ordinary stages and by wading at very low stages.*Winter flow*.—The high velocity prevents a complete ice cover at the gauge during the winter and open water measurements are obtained.*Observer*.—W. E. MacDonald, Waterton Park P.O., Alta.

DISCHARGE MEASUREMENTS of Waterton river near Waterton Park, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 1	W. H. Storey	140	316.0	0.63	2.93	191
Jan. 28	V. A. Newhall	97	84.8	1.36	2.54	115
Mar. 11	do	135	218.0	1.04	2.88	227
Mar. 30	S. H. Frame	210	276.0	1.64	3.13	452
April 20	do	150	481.0	1.22	3.31	557
May 22	do	149	613.0	1.81	3.80	1,080
June 12	do	160	848.0	3.40	4.66	2,776
July 8	do	160	805.0	4.19	4.90	3,325
July 29	do	150	466.0	2.10	3.70	965
Aug. 25	do	140	372.0	1.60	3.34	585
Sept. 13	do	140	371.0	1.56	3.35	568
Oct. 6	do	126	232.0	0.92	2.78	199
Dec. 1	H. W. Rowley	43	41.2	1.02	2.11	42
Dec. 20	do	41	61.0	2.33	2.52	143

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Waterton river near Waterton Park, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	2.93	264	2.62	140	2.73	174	3.02	318	.....x	962e	3.97	1,361
2....	2.69	161	2.64	145	2.71	167	3.01	312	.....	1,111e	3.95	1,325
3....	2.58	129	2.68	158	2.68	158	2.97	287	.....	1,260e	4.00	1,414
4....	2.56	124	2.66	151	2.71	167	2.94	269	.....	1,409e	4.17	1,738
5....	2.33	74	2.65	148	2.72	171	2.96	281	.....	1,557e	4.40	2,212
6....	2.61	137	2.64	145	2.73	174	2.95	275	.....	1,705e	4.47	2,362
7....	2.53	116	2.60	134	2.70	164	2.94	269	.....	1,853e	4.40	2,212
8....	2.52	114	2.68	158	2.71	167	2.93	264	4.30	2,001	4.43	2,276
9....	2.50	109	2.66	151	2.83	213	2.95	275	.....	1,871e	4.55	2,536
10....	2.50	109	2.68	158	2.43	94	2.98	293	.....	1,741e	4.74	2,959
11....	2.52	114	2.68	158	2.88	237	3.01	312	.....	1,611e	4.76	3,005
12....	2.54	119	2.69	161	2.93	264	3.17	427	.....	1,481e	4.66	2,779
13....	2.52	114	2.64	145	2.98	293	3.18	434	.....	1,351e	4.63	2,713
14....	2.52	114	2.62	140	2.95	275	3.20	450	.....	1,222e	4.78	3,050
15....	2.52	114	2.75	181	2.94	269	3.24	484	.....	1,093e	4.95	3,439
16....	2.51	111	2.78	192	2.96	281	3.26	501	.....x	964e	5.35	4,350
17....	2.51	111	2.81	204	2.99	299	3.32	553	3.60	835	5.65	5,034
18....	2.50	109	2.83	213	3.03	325	3.32	553	3.57	802	5.73	5,216
19....	2.52	114	2.81	204	3.05	338	3.32	553	3.68	930	6.10	6,060
20....	2.53	116	2.78	192	3.08	360	3.31	544	3.70	954	6.00	5,832
21....	2.52	114	2.77	189	3.14	404	3.31	544	3.80	1,088	5.80	5,376
22....	2.50	109	2.79	196	3.17	427	3.30	535	3.80	1,088	5.65	5,034
23....	2.54	119	2.81	204	3.10	374	3.26	501	3.80	1,088	5.10	3,780
24....	2.59	131	2.83	213	3.05	338	3.23	475	3.84	1,147	5.00	3,552
25....	2.58	129	2.82	209	3.06	345	3.22	467	3.89	1,225	4.49	2,405
26....	2.56	124	2.78	192	3.02	318	3.31	544	3.84	1,147	5.00	3,552
27....	2.54	119	2.75	181	3.03	325	3.32	553	3.79	1,074	5.13	3,848
28....	2.54	119	2.80	200	3.04	331	3.42	647	3.83	1,132	5.36	4,373
29....	2.55	121	2.78	192	3.08	360	3.50	727	3.90	1,241	5.43	4,532
30....	2.55	121	.....	.....	3.13	396	3.58	813	3.90	1,241	5.36	4,373
31....	2.58	129	.....	.....	3.05	338	.....	.....	3.89	1,225	.....	.....

e Discharge estimated.
 x-x No observer.

DAILY GAUGE HEIGHT AND DISCHARGE of Waterton river near Waterton Park, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	5.38	4,418	3.74	1,006	3.34	571	2.90	247	2.85	222	2.11	42
2....	5.36	4,373	3.65	893	3.34	571	2.87	232	2.86	227	.....	48e
3....	6.00	5,832	3.60	835	3.35	580	2.86	227	2.85	222	.....	54e
4....	4.55	2,536	3.58	813	3.40	627	2.90	247	2.84	218	.....	62e
5....	4.50	2,427	3.55	780	3.55	780	2.86	227	2.83	213	.....	68e
6....	4.46	2,341	3.54	769	3.56	791	2.78	192	2.84	218	.....x	72e
7....	4.73	2,937	3.52	748	3.57	802	2.85	222	2.84	218	2.34	76
8....	4.90	3,324	3.50	727	3.57	802	2.84	218	2.85	222	2.34	76
9....	4.95	3,438	3.55	780	3.54	769	2.82	209	2.85	222	2.34	76
10....	4.93	3,392	3.55	780	3.50	727	2.80	200	2.00	213e	2.59	131
11....	4.85	3,210	3.54	769	3.50	727	2.79	196	1.80	204e	2.48	105
12....	4.75	2,982	3.55	780	3.40	627	2.78	192	.....x	195e	2.48	105
13....	4.77	3,028	3.50	727	3.35	580	2.75	181	.....	186e	2.48	105
14....	4.70	2,869	3.45	676	3.45	676	2.74	178	.....	178e	2.48	105
15....	4.60	2,646	3.42	647	3.40	627	2.73	174	.....	170e	2.48	105
16....	4.50	2,427	3.40	627	3.35	580	2.73	174	.....	162e	2.48	105
17....	4.43	2,274	3.40	627	3.30	535	2.72	171	.....	154e	2.48	105
18....	4.35	2,106	3.42	647	3.29	526	2.73	174	.....	146e	2.46	100
19....	4.25	1,898	3.45	676	3.15	411	2.75	181	.....	138e	2.43	94
20....	4.20	1,797	3.40	627	3.15	411	2.78	192	.....	130e	2.52	114
21....	4.05	1,506	3.40	627	3.15	411	2.70	164	.....	122e	2.51	111
22....	4.05	1,506	3.35	580	3.15	411	2.67	154	.....	114e	2.48	105
23....	4.00	1,414	3.34	571	3.15	411	2.66	151	.....	106e	2.49	107
24....	3.97	1,361	3.36	589	3.15	411	2.66	151	.....	98e	2.49	107
25....	3.90	1,241	3.34	571	3.10	374	2.68	158	.....	90e	2.49	107
26....	3.89	1,225	3.36	589	2.98	293	2.69	161	.....	82e	2.49	107
27....	3.89	1,225	3.34	571	2.95	275	2.70	164	.....	74e	2.48	105
28....	3.87	1,194	3.33	562	2.93	264	2.75	181	.....	66e	2.63	142
29....	3.70	954	3.32	553	2.90	247	2.80	200	.....	58e	2.63	142
30....	3.60	835	3.32	553	2.90	247	2.84	218	.....	50e	2.63	142
31....	3.65	893	3.32	553	.....	.....	2.85	222	.....	.....	2.48	105

e Discharge estimated.

x-x River frozen to bottom at rod, no gauge reading.

MONTHLY DISCHARGE of Waterton river near Waterton Park, for 1916

(Drainage area 214 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	264	74	123	0.575	0.66	7,563
February.....	213	134	174	0.913	0.88	10,009
March.....	427	94	276	1.290	1.49	16,971
April.....	813	264	449	2.100	2.34	26,717
May.....	2,001	902	1,271	5.940	6.85	78,151
June.....	6,060	1,325	3,423	16.000	17.85	203,684
July.....	5,832	835	2,374	11.090	12.79	145,972
August.....	1,006	553	686	3.210	3.70	42,180
September.....	802	247	535	2.500	2.79	31,835
October.....	247	151	192	0.897	1.03	11,806
November.....	227	50	157	0.734	0.82	9,342
December.....	142	42	98	0.458	0.53	6,026
The year.....	.....	.....	.....	.....	51.73	590,256

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of Waterton river at Waterton Mills

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		457	330	384	856	539	192	460	28,264
November.....		132 ^b	371	267	536	384	157	343	20,406
December.....			181	179	201	197	98	171	10,525
January.....		245	121	161	111	123		152	9,358
February.....		217	110	134	91	174		145	8,218
March.....		112	110	131	92	276		144	8,867
April.....	1,035 ^a	364	373	611	548	449		469	27,907
May.....	1,650	1,509	1,577	1,913	1,369	1,271		1,548	95,195
June.....	3,106	1,744	3,383	1,993	1,713	3,423		2,560	152,348
July.....	1,136	1,205	1,133	905	981	2,374		1,289	79,258
August.....	744	454	638	431	496	686		575	35,345
September.....	1,255	270	273	394	507	535		539	32,072
Total in acre-ft.....	501,130	399,879	519,404	454,066	454,124	631,163			507,763

^a 19-30.^b 1-4.

CROOKED CREEK NEAR WATERTON PARK

Location.—On the SW. $\frac{1}{4}$ Sec. 22, Tp. 2, Rge. 29, W. 4th Mer.*Records available.*—September 15, 1909, to October 31, 1916.*Gauge.*—Vertical staff. Zero of gauge maintained at elevation of 89.48 feet during 1913-1916. For previous gauge data refer to previous reports.*Bench-marks.*—Permanent iron bench-mark located on the right bank, twenty-five feet from the gauge; assumed elevation 100.00 feet.*Channel.*—Consists of sand, gravel and small stones, not liable to shift.*Discharge measurements.*—Made with current-meter, by wading at low stages, and from high-way bridge about one mile down stream from the gauge at high stages.*Winter flow.*—No records are taken during winter season.*Observer.*—W. E. McDonald.

DISCHARGE MEASUREMENTS of Crooked creek near Waterton Park, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 28.....	S. H. Frame.....	14.5	14.70	1.67	2.12	25.0
April 18.....	do.....	15.0	18.50	1.64	2.22	30.0
May 16.....	do.....	16.0	20.60	1.76	2.36	37.0
May 22.....	do.....	15.0	17.20	1.15	2.21	30.0
June 10.....	do.....	15.0	24.10	4.54	3.10	109.0
June 12.....	do.....	20.0	54.80	1.89	3.03	104.0
July 8.....	do.....	16.0	27.50	1.75	2.50	49.0
July 29.....	do.....	14.0	16.80	0.85	1.96	14.3
Aug. 25.....	do.....	14.0	15.00	0.55	1.81	8.2
Sept. 13.....	do.....	14.0	16.40	0.64	1.85	10.5
Oct. 6.....	do.....	15.0	17.60	0.77	1.98	13.5

DAILY GAUGE HEIGHT AND DISCHARGE of Crooked creek near Waterton Park, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft
1.....				200.0x	2.50	49.0	2.99	99.0
2.....			4.31	236.0x	2.55	54.0	2.89	88.0
3.....			2.30	34.0	2.46	46.0	2.79	78.0
4.....			2.32	35.0	2.40	41.0	2.76	75.0
5.....			2.30	34.0	2.38	39.0	2.93	92.0
6.....			2.32	35.0	2.38	39.0	3.19	119.0
7.....			2.58	57.0	2.40	41.0	3.98	202.0
8.....			2.32	35.0	2.75	74.0	2.82	81.0
9.....			2.06	19.1	2.39	40.0	2.77	76.0
10.....			2.36	38.0	2.36	38.0	3.10	110.0
11.....				38.0e	2.38	39.0	3.33	134.0
12.....				38.0e	2.38	39.0	3.03	103.0
13.....			2.36	38.0	2.31	34.0	3.19	119.0
14.....			2.03	17.6	2.32	35.0	2.81	80.0
15.....			2.32	35.0	2.37	39.0	2.80	79.0
16.....			2.30	34.0	2.37	39.0	2.88	87.0
17.....			2.30	34.0	2.31	34.0	2.86	85.0
18.....			2.22	28.0	2.27	31.0	2.83	82.0
19.....			2.15	24.0	2.23	29.0	3.03	103.0
20.....			2.19	26.0	2.27	31.0	2.98	98.0
21.....			2.25	30.0	2.28	32.0	2.97	97.0
22.....			2.30	34.0	2.30	34.0	2.83	82.0
23.....			2.18	26.0	2.32	35.0	2.78	77.0
24.....			2.15	24.0	2.37	39.0	2.78	77.0
25.....			2.16	24.0	2.72	71.0	2.76	75.0
26.....			2.18	26.0	2.79	78.0	2.76	75.0
27.....			2.15	24.0	3.12	112.0	2.88	87.0
28.....	2.13	23.0	2.25	30.0	3.38	139.0	2.96	96.0
29.....		29.0e	2.30	34.0	3.12	112.0	2.63	62.0
30.....	2.32	35.0	2.30	34.0	3.02	102.0	2.08	20.0
31.....	2.16	24.0			3.00	100.0		

e Discharge estimated.

x Melting snow.

SESSIONAL PAPER NO. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Crooked creek near Waterton Park, for 1916
—Concluded

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	2.29	33.0	1.90	12.10	1.89	11.80	1.70	6.20
2.....	2.86	85.0	1.89	11.80	1.90	12.10	1.69	6.00
3.....	2.79	78.0	1.85	10.40	1.90	12.10	1.69	6.00
4.....	2.82	81.0	1.80	8.80	1.91	12.50	1.70	6.20
5.....	2.94	93.0	1.73	6.90	1.93	13.30	1.70	6.20
6.....	2.90	89.0	1.70	6.20	1.94	13.70	1.98	15.40
7.....	2.94	93.0	1.64	5.00	1.92	12.90	1.65	5.20
8.....	2.50	49.0	1.54	3.40	1.93	13.30	1.65	5.20
9.....	2.44	44.0	1.10	0.30	1.90	12.10	1.64	5.00
10.....	2.42	43.0	1.79	8.50	1.90	12.10	1.65	5.20
11.....	2.34	36.0	1.80	8.80	1.89	11.80	1.70	6.20
12.....	2.29	33.0	1.85	10.40	1.85	10.40	1.73	6.90
13.....	2.30	34.0	2.05	18.60	1.85	10.40	1.77	8.00
14.....	2.24	29.0	1.95	14.10	1.84	10.10	1.84	10.10
15.....	3.28	129.0	1.85	10.40	1.83	9.80	1.90	12.10
16.....	3.17	117.0	1.85	10.40	1.81	9.10	1.89	11.80
17.....	3.00	100.0	1.84	10.10	1.82	9.40	1.87	11.10
18.....	2.79	78.0	1.85	10.40	1.82	9.40	1.90	12.10
19.....	2.73	72.0	1.80	8.80	1.75	7.40	1.92	12.90
20.....	2.55	54.0	1.80	8.80	1.75	7.40	1.80	8.80
21.....	2.55	54.0	1.80	8.80	1.70	6.20	1.05	0.10
22.....	2.48	48.0	1.79	8.50	1.70	6.20	1.05	0.10
23.....	2.29	33.0	1.80	8.80	1.69	6.00	1.97	14.90
24.....	2.21	28.0	1.80	8.80	1.70	6.00	1.97	14.90
25.....	2.17	25.0	1.81	9.10	1.75	7.40	1.96	14.50
26.....	2.06	19.1	1.85	10.40	1.75	7.40	1.95	14.10
27.....	2.03	17.6	1.90	12.10	1.73	6.90	1.93	13.30
28.....	1.96	14.5	1.90	12.10	1.73	6.90	1.90	12.10
29.....	1.96	14.5	1.89	11.80	1.70	6.20	1.93	13.30
30.....	1.89	11.8	1.89	11.80	1.70	6.20	1.95	14.10
31.....	1.90	12.1	1.90	12.10	.....	.....	1.95	14.10

MONTHLY DISCHARGE of Crooked creek near Waterton Park, for 1916

(Drainage area 26 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (28-31).....	35.0	23.00	28.0	1.070	0.16	222
April.....	236.0	17.60	44.0	1.690	1.88	2,618
May.....	139.0	29.00	54.0	2.070	2.39	3,213
June.....	202.0	20.00	91.0	3.500	3.40	5,415
July.....	129.0	11.80	53.0	2.040	2.35	3,259
August.....	18.6	0.30	9.6	0.369	0.43	590
September.....	13.7	6.00	9.6	0.369	0.43	590
October.....	15.4	0.10	9.4	0.362	0.42	578
The period.....					11.46	16,485

WATERTON RIVER NEAR STAND OFF

Location.—On NW. $\frac{1}{4}$ Sec. 28, Tp. 6, Rge. 25, W. 4th Mer., about three-quarter mile below the bridge on the Macleod trail.

Records available.—November 5, 1915, to December 31, 1916.

Gauge.—Vertical staff to April 2, 1916; open chain gauge April 3 to December 31, 1916. Zero maintained at elevation of 90.11 feet since establishment. Gauge is read by E. Cuthbert Bellerby.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet to July 14, 1916, and 102.10 from July 14, 1916, to date.

Channel.—Composed of boulders and gravel, shifted considerably during June floods.

Discharge measurements.—Made with current-meter from cable car.

Winter flow.—Measurements made under cable at regular station.

Accuracy.—Stage-discharge relation permanent except during extreme flood conditions. Rating curve well defined between zero flow and 10,500 second-feet. Gauge read to hundredths daily, and with greater frequency during high water. Daily discharge ascertained by applying mean daily gauge heights to rating table; by Bolster method June 24 to June 28; and during ice conditions by applying to hydrograph mean daily gauge heights, discharge measurements and temperatures.

DISCHARGE MEASUREMENTS of Waterton river near Stand Off, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 18.....	W. H. Storey.....	111	173	1.27	2.68 ^b	221
Feb. 17.....	V. A. Newhall.....	158	727	3.25	5.20 ^b	2,394
April 4.....	S. H. Frame.....	125	282	2.77	2.02	782
May 6.....	do.....	140	400	4.36	2.92	1,745
June 15.....	do.....	151	599	6.81	4.43	4,079
June 22.....	W. A. Burton.....	311	1,218	8.61	6.12	10,484
June 24.....	do.....	175	773	6.69	4.98	5,173
June 25.....	do.....	174	730	6.18	4.74	4,509
June 26.....	do.....	174	732	6.14	4.72	4,496
June 27.....	do.....	175	752	6.40	4.82	4,811
June 28.....	do.....	178	813	7.04	5.33	5,721
June 29.....	do.....	181	818	7.71	5.52	6,308
June 29.....	do.....	181	839	8.00	5.66	6,714
July 13.....	S. H. Frame.....	180	664	5.50	4.41	3,652
Aug. 3.....	do.....	122	363	2.48	2.50	902
Sept. 1.....	W. A. Burton.....	115	323	1.91	2.06	617
Sept. 22.....	S. H. Frame.....	111	304	1.49	1.84	453
Nov. 27.....	H. W. Rowley.....	120	326	0.99	3.00 ^b	322
Dec. 16.....	do.....	115	138	1.48	2.75 ^b	205

^b Ice conditions.



View showing conditions at the gauging station on Waterton river near Stand Off, during the break-up in February, 1916. Taken on February 16, 1916, by V. A. Newhall.



Another view of the conditions at the gauging station on Waterton river near Stand Off, showing the ice deposited on the left bank. Taken on February 16, 1916, by V. A. Newhall.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Waterton river near Stand Off, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	2.09 ^b	230	2.98	184	2.82	400	2.02	788	2.49	1,228	3.46	2,508
2....	1.82	220	2.94	196	2.84 ^b	420	2.24	975	2.50	1,239	3.22	2,166
3....	2.04	215	2.99	208	3.44	380	2.01	780	2.52	1,262	3.15	2,068
4....	2.28	212	3.05	219	3.57	360	2.02	788	2.59	1,342	3.60	2,714
5....	2.29	212	2.98	225	3.56	340	1.93	720	2.76	1,546	4.13	3,556
6....	2.34	215	2.99	230	3.46	300	1.96	742	2.94	1,779	4.24	3,743
7....	2.23	221	2.98	242	3.52	340	1.95	735	3.27	2,236	3.95	3,258
8....	2.34	222	2.98	252	3.51	335	1.94	728	3.37	2,378	3.83	3,066
9....	2.36	215	2.97	254	3.49 ^b	360	1.92	713	3.30	2,278	4.03	3,389
10....	2.36	204	3.11	255	5.99 ^{gc}	1,000 ^e	1.94	728	3.15	2,068	4.43	4,075
11....	2.39	201	3.12	257	4.42	900	1.94	728	3.05	1,929	4.38	3,986
12....	2.43	201	3.07	260	4.15	860	1.95	735	2.91	1,738	4.15	3,590
13....	2.51	202	3.08	265	3.89	840	1.95	735	2.75	1,534	4.11	3,522
14....	2.54	206	3.07	320	3.55	800	1.94	728	2.67	1,436	4.08	3,472
15....	2.56	211	3.04 ^g	1,100	2.92	900	2.02	788	2.57	1,319	4.46	4,128
16....	2.59	218	.....	1,800 ^e	2.14	886	2.00	772	2.50	1,239	4.94	5,088
17....	2.65	220	5.20 ^b	2,400	2.02	788	2.02	788	2.42	1,159	5.20	5,718
18....	2.68	221	4.44	2,000	1.92	713	2.03	796	2.36	1,091	5.45	6,456
19....	2.79	221	3.92	1,600	1.94	728	2.02	788	2.40	1,131	5.65	7,180
20....	2.81	221	3.87	1,200	2.01	780	2.00	772	2.46	1,196	5.92	7,976
21....	2.80	210	3.52	1,000	2.11	861	2.00	772	2.55	1,296	6.06	9,896
22....	2.78	198	3.30	800	2.08	836	2.04	804	2.65	1,413	6.12	10,502
25....	2.80	185	3.33	750	2.06	820	1.98	757	2.70	1,472	5.21	5,746
24....	2.69	170	3.47	800	1.89	691	1.96	742	2.81	1,609	4.92	5,044
25....	2.75	158	3.41	750	1.82	643	1.95	735	3.23	2,180	4.75	4,509 ^d
26....	2.90	150	3.13	600	1.85	663	1.94	728	3.25	2,208	4.74	4,496 ^d
27....	2.90	150	2.90	500	1.89	691	1.94	728	3.27	2,236	4.79	4,811 ^d
28....	2.92	153	2.87	460	1.86	670	2.14	886	3.33	2,321	5.36	5,721 ^d
29....	2.95	158	2.82	400	2.02	788	2.24	975	3.39	2,407	5.53	6,510 ^d
30....	2.94	167	.....	.....	1.92	713	2.36	1,091	3.44	2,479	5.31	5,066
31....	2.99	172	.....	.....	1.94	728	.....	.....	3.24	2,194	.....	.....

b-b Ice conditions from January 1 to February 17; March 2 to March 9.

e Discharge estimated by field inspection.

g Ice going out.

c Backwater from ice jam.

d Actual measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Waterton river near Stand Off, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	5.00	4,922	2.48	894	2.06	590	1.59	346	1.45	289	2.17	297
2....	4.94	4,787	2.41	838	2.03	571	1.57	337	1.48	300	2.10	294
3....	5.00	4,922	2.50	910	2.14	641	1.61	355	1.51	311	2.64	293
4....	4.94	4,787	.....x	896	2.37	807	1.61	355	1.54	324	2.43	290
5....	4.78	4,434	.....	882	2.65	1,041	1.61	355	1.48	300	2.16	287
6....	4.62	4,096	.....	868	2.65	1,041	1.61	355	1.46	293	2.36	282
7....	4.49	3,830	.....	854	2.65	1,041	1.62	359	1.46	293	2.28	275
8....	4.49	3,830	.....	840	2.61	1,004	1.58	341	1.49	303	1.88	266
9....	4.61	4,075	.....	826	2.55	952	1.54	324	1.53	320	1.53	255
10....	4.62	4,096	.....	812	2.50	910	1.50	307	1.46	293	1.49	242
11....	4.56	3,972	.....	798	2.48	894	1.48	300	1.78	434	2.22	228
12....	4.44	3,730	.....	783	2.35	792	1.45	289	3.67b	426	2.82	220
13....	4.41	3,670	.....	768	2.28	739	1.43	282	3.71	420	2.64	213
14....	4.41	3,670	.....	753	2.23	703	1.40	271	3.83	414	2.65	209
15....	4.30	3,454	.....x	738	2.22	695	1.38	264	4.14	407	2.74	208
16....	4.10	3,084	2.26	724	2.13	634	1.40	271	3.97	401	2.75	205
17....	3.95	2,825	2.29	746	2.08	602	1.47	296	3.74	395	2.55	204
18....	3.86	2,673	2.42	846	2.03	571	1.49	303	3.80	387	2.60	202
19....	3.73	2,462	2.43	854	1.95	524	1.49	303	3.83	380	2.65	200
20....	3.58	2,228	2.38	815	1.86	475	1.47	296	3.80	374	2.53	197
21....	3.45	2,035	2.38	815	1.83	460	1.48	300	3.59	367	2.39	195
22....	3.38	1,934	2.33	776	1.82	454	1.49	303	3.59	361	2.42	191
23....	3.25	1,752	2.30	753	1.77	430	1.50	307	3.44	354	2.53	187
24....	3.18	1,656	2.25	717	1.77	430	1.46	293	3.12	347	2.50	183
25....	3.06	1,498	2.20	681	1.78	434	1.46	293	3.04	338	2.49	178
26....	2.99	1,408	2.25	717	1.72	405	1.45	289	2.91	332	2.54	175
27....	2.82	1,209	2.25	717	1.72	405	1.47	296	2.79	322	2.60	172
28....	2.73	1,117	2.19	674	1.74	415	1.50	307	2.60	318	2.53	170
29....	2.66	1,050	2.15	648	1.66	373	1.49	303	2.39	312	2.26	168
30....	2.56	961	2.14	641	1.64	368	1.46	293	2.28	303	2.30	167
31....	2.52	927	2.13	634	.....	.....	1.46	293	.....	.....	2.37b	166

b-b Ice conditions.*x-x* Observer sick, no gauge reading, discharge estimated.

MONTHLY DISCHARGE of Waterton river near Stand Off, for 1916

(Drainage area 740 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	230	150	199	0.269	0.31	12,236
February.....	2,400	184	673	0.910	0.98	38,711
March.....	1,000	300	673	0.910	1.05	41,381
April.....	1,091	713	785	1.060	1.18	46,711
May.....	2,479	1,091	1,708	2.310	2.66	105,020
June.....	10,502	2,068	4,819	6.510	7.26	286,751
July.....	4,922	927	2,939	3.970	4.58	180,711
August.....	910	634	781	1.060	1.22	48,022
September.....	1,041	368	647	0.874	0.98	38,499
October.....	359	264	309	0.418	0.48	19,000
November.....	434	289	347	0.468	0.52	20,648
December.....	297	166	220	0.297	0.34	13,527
The year.....	.....	.....	.....	.....	21.56	851,217

SESSIONAL PAPER No. 25b

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Waterton river drainage basin, in 1916

Date	Engineer	Stream	Location	Width	Area of Section	Mean Velocity	Discharge
				<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
January 2	W. H. Storey...	Blakiston brook	SE. 36-1-30-4 ..	48	71.4	0.52	37.0
April 19	S. H. Frame...	do	do ..	35	35.4	3.12	109.0
May 20	do ...	do	do ..	41	51.4	3.90	199.0
June 12	do ...	do	do ..	29	76.8	6.79	523.0
July 31	do ...	do	do ..	39	43.4	2.60	111.0
August 26	do ...	do	do ..	28	33.8	1.79	61.0
Sept. 14	do ...	do	do ..	28	37.6	1.97	74.0
October 5	do ...	do	do ..	24	25.4	1.44	36.0
January 1	W. H. Storey...	Crooked creek	SW. 16-2-29-4 ..	17	7.7	0.92	7.0
April 20	S. H. Frame...	do	do ..	18	14.0	2.14	30.0
May 22	do ...	do	do ..	19	14.2	2.22	31.0

x Supplementary to measurements of Waterton river.

BELLY RIVER DRAINAGE BASIN

General Description

Belly river rises near Chief mountain in northern Montana. The main stream is augmented on the United States side of the boundary line by Middle Fork and on the Canadian side by North Fork. From the junction with North Fork in Sec. 21, Tp. 1, Rge. 28, West of the 4th Meridian, the river flows in a winding northeasterly course until it joins the Oldman river in Sec. 27, Tp. 9, Rge. 23, West of the 4th Meridian. From this point the stream is now known as the Oldman river, although it was formerly called the Belly river, until it is joined by the Bow river and forms the South Saskatchewan river.

The topography of the basin is of the most varied character, ranging from the mountainous regions of Montana and the rolling prairie and foot-hills at the boundary to the level prairie. The upper tributaries drain a forested region; the main stream flows through a deep valley with many clumps of poplar on its banks.

There is an abundant snowfall in the upper portion of the basin, but the precipitation diminishes into semi-arid conditions near the junction with the Oldman river. At first Belly river is a comparatively clear stream but soon after crossing the boundary line it gradually becomes turbid, especially at the times of high water. The greater portion of the sediment is caused by the washing away of banks and cutting of new channels. Freshets caused by melting snow and heavy rains are frequent in the summer. The maximum flow usually occurs in June or July and after that the flow gradually decreases until it reaches the minimum in January or February.

As yet very little use has been made of the water in this basin. In the upper regions, where water could easily be diverted, it is not required for irrigation purposes and farther down stream it would be an expensive undertaking. There are, however, several small private irrigation schemes diverting water from the river.

The Alberta Railway and Irrigation Company have located and may construct a canal from Belly river to supply their irrigation system, if St. Mary river is found deficient. A survey and estimate of the cost of this proposed canal were made by the Government during 1912, and a copy of the report of this survey may be seen in the report of the Commissioner of Irrigation for 1912. There are also a number of feasible power sites in the upper regions which will no doubt be developed when there is a market.

BELLY RIVER NEAR MOUNTAIN VIEW

Location.—On the NE. $\frac{1}{4}$ Sec. 5, Tp. 2, Rge. 28, W. 4th Mer., at John West's ranch.

Records available.—November 1, 1911, to December 31, 1916.

Gauge.—Vertical staff to September 14; open chain to December 31, 1916. Zero maintained at elevation 4,544.90 feet during 1911-1916. Gauge read by J. N. West.

Bench-mark.—Permanent iron bench-mark, located on the right bank at the station, elevation 4,356.74 feet above mean sea-level (Irrigation Surveys datum).

Channel.—Permanent.

Discharge measurements.—Made from cable for all open water measurements.

Winter flow.—Winter measurements are made about 100 feet above the cable.

Accuracy.—Stage—discharge relation liable to shift during high water, otherwise permanent. Rating curve well defined between March 28 and June 13; shifting control during high water period June 13 to July 7; well defined between July 7 and October 5. Gauge read daily to hundredths

of a foot. Daily discharge ascertained by applying mean daily gauge heights to rating table; Bolster method applied between June 13 and July 7; during ice conditions applied to hydrograph mean daily gauge heights, discharge measurements and temperatures.

Remarks.—The staff gauge was replaced by chain gauge on September 15, 1916.

DISCHARGE MEASUREMENTS of Belly river near Mountain View, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 25	V. A. Newhall	45.0	66.9	0.58	1.80b	39
Mar. 8	do	57.0	95.1	0.68	1.90b	65
Mar. 28	S. H. Frame	84.0	193.0	0.97	2.05	188
April 18	do	86.0	206.0	1.30	2.27	268
May 16	do	88.0	240.0	1.53	2.49	368
May 23	do	92.0	267.0	2.00	2.79	534
June 13	do	100.0	331.0	3.24	3.57	1,073
July 7	do	102.0	364.0	3.87	3.81	1,410
July 28	do	91.0	246.0	2.31	2.82	569
Aug. 24	do	89.0	226.0	1.65	2.49	374
Sept. 12	do	88.0	202.0	1.50	2.33	303
Sept. 16	do	88.0	188.0	1.26	2.23	237
Oct. 5	do	84.0	167.0	0.83	1.94	139
Nov. 30	do	65.0	107.0	0.58	2.01b	64
Dec. 19	H. W. Rowley	60.0	74.0	0.93	2.01b	69

b Ice conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Belly river near Mountain View, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1. . . .	1.30 ^b	62	36	2.14	74	2.11	203	2.61	432	2.89	595	
2. . . .	2.36	52	35	2.19	72	2.06	185	2.59	421	2.88	589	
3. . . .	1.30	45	35	2.29	71	2.10	199	2.55	399	2.93	620	
4. . . .	2.30	42	35	2.14	69	2.06	185	2.80	540	3.36	913	
5. . . .	2.34	43	34	2.14	68	2.04	178	3.04	691	3.75	1,220	
6. . . .	2.40	50	34	2.29	68	2.04	178	3.24	827	3.67	1,154	
7. . . .	2.70	65	34	2.24	67	2.04	178	3.58	1,081	3.50	1,018	
8. . . .	2.70	72	35	2.34	65	2.06	185	3.47	995	3.46	988	
9. . . .	2.70	73	36	2.10	65	2.05	181	3.11	738	3.63	1,122	
10. . . .	2.39	73	38	2.20	70	2.19	234	3.00	665	3.94	1,376	
11. . . .	2.30	71	48	2.99	110	2.20	238	2.91	607	3.85	1,302	
12. . . .	2.21	60	150	3.09	185	2.18	230	2.76	517	3.87	1,318	
13. . . .	2.25	48	340	2.99	265	2.16	222	2.64	448	3.60	1,073 ^s	
14. . . .	2.25	47	570	2.29	281	2.30	279	2.57	410	3.90	1,346	
15. . . .	2.60	49	1,000	2.29	230	2.31	283	2.52	383	4.05	1,474	
16. . . .	2.40	54	1,000	2.28 ^b	300	2.30	279	2.49	368	4.55	1,898	
17. . . .	2.25	63	750	2.65	454	2.29	275	2.48	363	4.70	2,018	
18. . . .	2.20	71	480	2.12	207	2.27	266	2.49	368	4.78	2,099	
19. . . .	2.20	72	2.56	200	2.13	210	2.25	258	2.57	410	5.05	2,319
20. . . .	2.20	68	2.56	145	2.18	230	2.22	246	2.76	517	5.00	2,282
21. . . .	2.36	63	2.57	125	2.17	226	2.25	258	2.81	546	5.23	2,477
22. . . .	2.30	56	2.22	114	2.13	210	2.22	246	2.83	558	4.44	1,840
23. . . .	2.20	48	2.22	103	2.10	199	2.18	230	2.79	534	3.96	1,450
24. . . .	43	2.22	95	2.12	207	2.20	238	2.79	534	3.90	1,404	
25. . . .	1.80	39	2.22	88	2.11	203	2.15	218	2.81	546	3.89	1,402
26. . . .	^x 36	2.23	83	2.01	167	2.20	238	2.87	582	3.95	1,457	
27. . . .	35	2.18	78	2.05	181	2.38	315	2.90	601	4.15	1,630	
28. . . .	35	2.23	77	2.05	181	2.55	399	2.97	646	4.65	2,049	
29. . . .	35	2.13	76	2.15	218	2.58	415	2.96	639	4.70	2,096	
30. . . .	36	2.14	214	2.57	410	2.94	627	4.38	1,838			
31. . . .	^x 36	2.12	207			2.91	607					

b-b Ice conditions; discharge taken from winter hydrograph

x-x River frozen to bottom at gauge, no readings.

s Shifting conditions, June 13 to July 7.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Belly river near Mountain View, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-f</i>
1....	4.16	1,662	2 76	530	2.49	374	2.00	164	1.96	150	.....	64
2....	4.19	1,692	2 75	524	2.45	353	2.01	167	1.99	161	1.97	63
3....	4.19	1,698	2 73	512	2.53	395	2.02	171	2.02	171	1.89	65
4....	4.21	1,720	2 74	518	3.03	724	1.98	157	2.01	166	1.85	67
5....	4.01	1,564	2 75	524	2.96	670	1.94	144	1.99	161	1.96	67
6....	3.81	1,404	2 66	469	2.92	640	1.94	144	2.00	164	2.03	66
7....	3.81	1,410 ^a	2 61	440	2.76	530	1.95	147	1.95	147	1.78	64
8....	3.89	1,841	2 67	475	2.72	505	1.91	134	1.94	144	1.94	59
9....	3.96	1,544	3 00	700	2.60	434	1.86	119	2.19 ^b	135	2.07	58
10....	4.07	1,643	2.95	662	2.50	379	1.84	113	2.20	128	2.15	59
11....	4.06	1,634	2 92	640	2.41	333	1.88	125	2.19	122	2.14	62
12....	3.90	1,490	2 86	597	2.33	295	1.90	131	2.22	119	2.14	63
13....	3.92	1,508	2 82	570	2.28	272	1.90	131	2.24	118	2.10	64
14....	3.95	1,535	2 78	543	2 25	259	1.92	137	2.24	117	2.08	66
15....	3.57	1,193	2 65	463	2.24	255	1.90	131	2.14	115	2.06	67
16....	3.54	1,166	2 65	463	2 23	251	1.89	128	2.06	110	2.07	68
17....	3.51	1,139	2 69	487	2 22	246	1.91	134	2.07	105	2.05	68
18....	3.50	1,130	2 73	512	2 25	259	1.94	144	2.02	100	2.04	69
19....	3.45	1,085	2 74	518	2 22	246	1.94	144	1.98	94	2.01	69
20....	3.20	863	2 66	469	2 15	218	1.91	134	2.00	85	2.03	68
21....	3.10	780	2 59	428	2 15	218	1.92	137	1.97	76	2.16	65
22....	3.09	772	2 53	395	2 15	218	1.90	131	1.95	69	2.18	62
23....	3.09	772	2 51	384	2 10	199	1.91	134	1.86	64	2.25	58
24....	3.13	805	2 49	374	2 14	214	1.91	134	1.83	60	2.23	54
25....	2.96	670	2 44	348	2 11	203	1.90	131	1.82	57	2.20	52
26....	3.00	700	2 45	353	2 10	199	1.89	128	1.86	56	2.19	51
27....	2.87	604	2 55	406	2 09	195	1.92	137	1.88	57	2.20	51
28....	2.88	611	2 52	390	2 08	192	2.00	164	.....	58	2.11	52
29....	2.77	537	2 52	390	2 05	181	1.98	157	.....	62	2.10	56
30....	2.75	524	2 50	379	2 03	174	1.99	161	2.01	64	2.15	60
31....	2.75	524	2 47	363	.....	.....	2.00	164	.....	.....	2.11 ^b	65

b-b Ice conditions.*e* Discharge estimated.

MONTHLY DISCHARGE of Belly river near Mountain View, for 1916

(Drainage area 121 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	73	35	53	0.438	0.50	3,259
February.....	1,000	34	203	1.680	1.81	11,677
March.....	454	65	173	1.430	1.65	10,637
April.....	415	178	248	2.050	2.29	14,757
May.....	1,081	363	568	4.690	5.41	34,925
June.....	2,477	589	1,479	12.220	13.63	88,007
July.....	1,720	524	1,157	9.560	11.02	71,141
August.....	700	348	478	3.950	4.55	29,391
September.....	724	174	321	2.650	2.96	19,101
October.....	171	113	141	1.170	1.35	8,670
November.....	171	56	108	0.893	1.00	6,426
December.....	69	51	62	0.512	0.59	3,812
The year.....	.....	.....	.....	.....	46.76	301,803

MEAN MONTHLY DISCHARGE in Second-feet of Belly river near Mountain View

MONTH	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		160	209	383	325	141	244	14,978
November	143	137	159	272	196	108	169	10,065
December	89	87	84	113	97	62	89	5,458
January	90	66	78	72	53		72	4,420
February	47	53	65	56	203		85	4,811
March	51	53	65	51	173		79	4,487
April	203	227	253	262	248		239	14,198
May	662	680	797	609	568		663	40,973
June	718	1,428	868	934	1,479		1,085	64,590
July	512	632	535	608	1,157		689	43,087
Aug	280	392	284	376	475		364	22,370
September	177	194	232	334	321		252	14,970
Total in acre-ft.	182,623	249,395	219,754	246,346	320,524			244,407

MAMI CREEK AT MOUNTAIN VIEW

Location.—On the SE. $\frac{1}{4}$ Sec. 19, Tp. 2, Rge. 27, W. 4th Mer.

Records available.—August 13, 1909, to October 31, 1916.

Gauge.—Vertical staff on bridge pier. Zero of gauge maintained at elevation 93.06 during 1909-1916.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Composed of stones covered with sand and gravel; not liable to shift, except in high floods.

Discharge measurements.—Made with current-meter by wading, during low water and from highway bridge at high stages.

Winter flow.—Records are discontinued during winter season.

Observer.—C. H. Findlay.

DISCHARGE MEASUREMENTS of Mami creek at Mountain View, in 1916

Date	Hydrographer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 11	V. A. Newhall				2.85 ^c	0.0 ^z
Mar. 27	S. H. Frame	21.0	12.00	2.25	1.97	27.0
Mar. 31	do	21.0	12.00	2.08	1.95	25.0
April 17	do	20.0	11.80	1.93	1.94	23.0
April 21	do	19.5	11.10	1.61	1.85	17.9
May 15	do	20.0	12.00	1.92	1.91	23.0
May 23	do	20.0	11.00	1.73	1.83	18.9
June 13	do	23.0	20.00	3.16	2.22	63.0
July 7	do	20.0	13.10	2.81	2.07	37.0
July 28	do	13.0	5.60	1.61	1.76	9.0
Aug. 24	do	12.0	4.30	0.95	1.68	4.1
Sept. 12	do	11.0	4.00	0.82	1.64	3.3
Sept. 16	do	11.0	3.80	0.92	1.65	3.5
Oct. 4	do	10.0	3.60	1.36	1.70	4.9 ⁱ
Oct. 7	do	11.0	4.40	1.41	1.70 ^c	6.2

^z No measurement, stream frozen over; discharge very small.

^c Gauge height affected by backwater from ice.

ⁱ Stream frozen over.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Mami creek at Mountain View, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			2.20	60.0	1.98	29.0	2.30	79.0
2.....			2.05	37.0	2.20	60.0	2.25	69.0
3.....			2.05	37.0	2.00	31.0	2.20	60.0
4.....			2.05	37.0	1.98	29.0	2.20	60.0
5.....			1.99	30.0	1.97	27.0	2.35	89.0
6.....			2.00	31.0	1.97	27.0	2.35	89.0
7.....			2.05	37.0	1.95	25.0	2.30	79.0
8.....			2.05	37.0	1.92	22.0	2.23	65.0
9.....	4.57	180.0e	2.05	37.0	1.89	19.7	2.20	60.0
10.....	4.57	180.0e	2.00	31.0	1.86	17.1	2.35	89.0
11.....	3.97	120.0e	1.98	29.0	1.82	13.9	2.50	119.0
12.....	2.35	87.0e	1.98	29.0	1.92	22.0	2.40	99.0
13.....	2.31	85.0e	1.95	25.0	1.92	22.0	2.22	63.0
14.....	2.26	60.0e	1.95	25.0	1.90	20.6	2.27	73.0
15.....	2.19	55.0e	1.98	29.0	1.88	18.8	2.20	59.0
16.....	2.15	51.0	1.95	25.0	2.00	31.0	2.15	50.0
17.....	2.10	44.0	1.94	24.0	1.95	25.0	2.10	41.0
18.....		40.0e	1.95	25.0	1.87	18.0	1.08	0.16
19.....	2.05	37.0	1.93	23.0	1.87	18.0	1.10	0.20
20.....	2.10	44.0	1.97	27.0	1.83	14.6	1.10	0.20
21.....	2.10	44.0	1.85	16.2	1.90	21.0	1.30	0.60
22.....	2.00	31.0	1.91	22.0	1.78	11.0	1.15	0.30
23.....	1.95	25.0	1.90	21.0	1.98	29.0	1.10	0.20
24.....	1.90	21.0	1.88	18.8	2.08	41.0	1.00	0.00
25.....	1.85	16.2	1.84	15.4	2.28	75.0	1.15	0.30
26.....	1.85	16.2	1.84	15.4	2.33	85.0	1.30	0.60
27.....	1.97	27.0	1.84	15.4	2.69	157.0	1.10	0.20
28.....	1.85	16.2	1.89	19.7	2.39	97.0	2.15	50.00
29.....	1.85	16.2	1.93	23.0	2.50	119.0	2.10	41.00
30.....	2.01	32.0	1.95	25.0	2.40	99.0	2.10	41.00
31.....	1.95	25.0			2.30	79.0		

e Discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Mami creek at Mountain View, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	2.10	41.0	1.73	6.5	1.67	4.0	1.59	2.5
2.....	3.10	239.0	1.72	6.0	1.67	4.0	1.59	2.5
3.....	3.00	219.0	1.72	6.0	1.70	4.9	1.70	4.9
4.....	2.60	139.0	1.72	6.0	1.85	14.6	1.70	4.9 <i>i</i>
5.....	2.20	59.0	1.72	6.0	1.80	10.9	1.70	4.9
6.....	2.15	50.0	1.71	5.4	1.78	9.6	1.76	8.3
7.....	2.07	37.0	1.70	4.9	1.76	8.3	1.70	4.9 <i>c</i>
8.....	2.07	37.0	1.70	4.9	1.75	7.6	1.75	7.6
9.....	2.05	34.0	1.85	14.6	1.73	6.5	1.75	7.6
10.....	2.00	28.0	1.95	23.2	1.70	4.9	1.75	7.6
11.....	1.95	23.0	1.90	18.6	1.67	4.0	1.75	7.6
12.....	1.93	21.0	1.80	10.9	1.64	3.2	1.74	7.1
13.....	1.90	18.6	1.75	7.6	1.64	3.2	1.74	7.1
14.....	1.88	17.0	1.70	4.9	1.62	2.9	1.72	6.0
15.....	1.85	14.6	1.70	4.9	1.61	2.8	1.72	6.0
16.....	1.83	13.1	1.70	4.9	1.65	3.4	1.72	6.0
17.....	1.83	13.1	1.70	4.9	1.59	2.5	1.70	4.9
18.....	1.84	13.9	1.70	4.9	1.59	2.5	1.70	4.9
19.....	1.84	13.9	1.70	4.9	1.59	2.5	1.70	4.9
20.....	1.84	13.9	1.70	4.9	1.59	2.5	1.74	7.1
21.....	1.82	12.4	1.70	4.9	1.59	2.5	1.74	7.1
22.....	1.82	12.4	1.70	4.9	1.59	2.5	1.75	7.6
23.....	1.83	13.1	1.70	4.9	1.59	2.5	1.75	7.6
24.....	1.83	13.1	1.68	4.3	1.59	2.5	1.74	7.1
25.....	1.83	13.1	1.66	3.7	1.59	2.5	1.72	6.0
26.....	1.83	13.1	1.67	4.0	1.59	2.5	1.71	5.4
27.....	1.86	15.4	1.67	4.0	1.59	2.5	1.70	4.9
28.....	1.76	8.3	1.67	4.0	1.59	2.5	1.70	4.9
29.....	1.78	9.6	1.67	4.0	1.59	2.5	1.70	4.9
30.....	1.78	9.6	1.67	4.0	1.59	2.5	1.70	4.9
31.....	1.76	8.3	1.67	4.0	.....	.....	1.70	4.9

c Gauge height affected by backwater from ice.*i* Stream frozen over.

MONTHLY DISCHARGE of Mami creek at Mountain View, for 1916

(Drainage area 22 square miles)

MONTH	DISCHARGE IN SECOND-FeET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (9-31).....	180.0	16.20	54.0	2.450	2.08	2,463
April.....	60.0	15.40	28.0	1.270	1.42	1,666
May.....	157.0	11.00	42.0	1.910	2.20	2,582
June.....	119.0	0.16	46.0	2.090	2.33	2,737
July.....	239.0	8.30	38.0	1.730	1.99	2,336
August.....	23.2	3.70	6.5	0.295	0.34	400
September.....	14.6	2.50	4.3	0.195	0.22	256
October.....	8.3	4.90	5.9	0.268	0.31	363
The period.....	.....	.....	.....	.....	10.89	12,803

SESSIONAL PAPER No. 25B

MEAN MONTHLY DISCHARGE in Second-feet, of Mami creek at Mountain View

MONTH	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		3.60		3.30	1.30	5.2	25.0	5.9	7.4	454
November				2.20 ^e						
December										
January										
February										
March						36.0 ^c	54.0 ^d			
April	4.10	m	18.50	24.00 ^a	9.60 ^b	12.3	28.0		15.7	936
May	7.00		11.70	15.70	12.10	27.0	42.0		19.2	1,187
June	3.00		4.30	5.20	5.70	104.0	46.0		28.0	1,673
July	0.20		4.10	2.30	2.40	42.0	38.0		14.8	913
August	Nil		3.40	1.51	0.97	28.0	6.5		6.7	414
September	2.80		1.04	1.05	1.38	17.0	4.3		4.6	273
Total in acre-ft.	1,033	221	2,598	2,638	1,719	14,562	13,977			5,850

a 15-30.

b 17-30.

m No observer in 1911.

c 28-31.

d 9-31.

e 1-15.

CHRISTIANSON DITCH NEAR MOUNTAIN VIEW

Location.—On the SE. $\frac{1}{4}$ Sec. 12, Tp. 3, Rge. 28, W. 4th Mer.*Records available.*—May 17 to July 1, 1913.*Gauge.*—Vertical staff; elevation of zero 96.04 feet. Gauge not read during 1914-16.*Bench-mark.*—Wooden stake in left bank assumed elevation 100.00 feet.*Channel.*—Permanent.*Discharge measurements.*—Made by weir or current-meter.*Remarks.*—One discharge measurement only in 1914. Ditch not used during 1915-16.

BELLY RIVER NEAR STAND OFF

Location.—On the NE. $\frac{1}{4}$ Sec. 16, Tp. 6, Rge. 25, W. 4th Mer., near Stand Off.*Records available.*—May 27, 1909, to December 31, 1916.*Gauge.*—Chain gauge on bridge January 1 to February 15; zero at 90.82 feet.

Vertical staff February 22 to November 27; zero at 91.09 feet.

Box chain gauge at bridge site November 28 to December 31; zero 90.81 feet.

For information prior to 1916 see previous reports.

Gauge read by Thomas Graham.*Bench-marks.*—Permanent iron bench-mark; assumed elevation 100.00 feet.*Channel.*—Composed of clean gravel and small stones, not liable to shift.*Discharge measurements.*—Made with current-meter by wading at low stages and from cable at high stages.*Winter flow.*—Measurements through the ice are made at a point two hundred feet above new chain gauge.*Accuracy.*—Stage discharge relation practically permanent; not altered by ice during year. Rating table well defined between zero flow and 3,200 second-feet. Gauge read daily, except for short periods, to one one-hundredth of a foot.

Daily discharge ascertained by applying mean daily gauge heights to rating table, results good; Bolster method used from April 3 to June 15; during ice conditions applied to hydrograph mean daily gauge heights, discharge measurements and temperatures.

Remarks.—The high floods of February 16, 1916, carried away the highway bridge and destroyed the gauging station. The station was re-established February 22. A box chain gauge was installed November 28.

DISCHARGE MEASUREMENTS of Belly river near Stand Off, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 17	W. H. Storey	85.5	63.9	1.16	2.12 ^b	74
April 3	S. H. Frame	105.0	135.0	3.06	1.64	413
May 5	do	92.0	202.0	3.17	2.11	640
June 15	do	97.0	315.0	4.60	3.27	1,450
June 25	W. A. Burton	98.0	315.0	4.75	3.31	1,496
June 26	do	99.0	321.0	4.92	3.42	1,580
June 27	do	99.0	339.0	5.04	3.56	1,707
June 28	do	153.0	595.0	5.48	5.56	3,262
July 14	S. H. Frame	98.0	314.0	4.62	3.27	1,451
Aug. 3	do	93.0	188.0	2.71	1.97	511
Sept. 1	W. A. Burton	90.0	160.0	2.24	1.67	358
Sept. 22	S. H. Frame	89.0	131.0	1.56	1.26	205
Nov. 28	H. W. Rowley	66.0	62.1	1.84	1.21 ^b	114
Dec. 15	do	57.0	50.1	1.10	1.33 ^b	95

^b Ice conditions.^x Temporary gauge on bridge.

DAILY GAUGE HEIGHT AND DISCHARGE of Belly river near Stand Off, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	<i>b</i>	47	1.92	92	0.95	125	2.07	575	1.85	486	2.75	1,086
2		49	2.01	100	0.97	129	2.02	545	1.96	551	2.55	935
3		51	2.02	105	1.30	218	1.64	413 ^s	1.84	474	2.18	672
4		52	2.09	108	1.30	218	1.55	370	1.92	521	2.50	891
5		53	2.14	111	1.24	199	1.40	307	2.11	639	2.75	1,078
6		54	2.14	111	1.20	187	1.38	296	2.40	840	3.20	1,431
7		55	2.31	110	1.00	136	1.38	296	2.63	1,009	3.11	1,360
8		56	2.38	110	1.05	147	1.37	288	2.80	1,141	2.90	1,188
9		56	2.30	110	2.69	400	1.39	296	2.60	987	3.00	1,266
10		58	2.34	111		600 ^e	1.40	296	2.35	804	3.26	1,470
11		60	2.10	115		650 ^e	1.47	323	2.15	672	3.54	1,683
12		64	2.11	120		600 ^e	1.49	331	2.04	600	3.24	1,446
13		66	2.14	125		450 ^e	1.43	307	1.95	545	3.10	1,336
14		68	2.24	131		400 ^e	1.53	344	1.80	457	3.18 ^a	1,391 ^s
15		70	2.26 ^b	140		380 ^e	1.56	357	1.76	434	3.27	1,462
16	<i>b</i>	72		1,200 ^{eg}		420 ^e	1.51	335	1.74	423	3.95	1,997
17	2.12	74		1,750 ^e		440 ^e	1.49	323	1.69	398	4.30	2,272
18	2.12	68	9.01	1,500 ^e		460 ^e	1.46	311	1.71	408	4.40	2,350
19	2.10	64		1,000 ^e		500 ^e	1.44	303	1.72	413	4.64	2,539
20	2.09	58		600 ^e		480 ^e	1.41	292	1.77	440	4.80	2,665
21	2.09	53		400 ^e		500 ^e	1.42	296	1.79	451	5.00	2,822
22	1.93	48	2.05	360	2.54	600	1.44	299	1.91	521	4.45	2,390
23	1.82	45	1.90	340		677 ^e	1.40	284	2.06	607	3.85	1,918
24	1.66	44	1.72	320		456 ^e	1.33	259	2.21	706	3.51	1,651
25	1.65	46	1.80	300	1.35	235	1.31	252	2.94	1,250	3.31	1,494
26	1.73	52	1.74	300	1.32	225	1.34	259	3.71	1,063	3.41	1,572
27	1.75	57	1.49	284	1.34	232	1.41	284	2.87	1,188	3.58	1,705
28	1.78	63	1.60	327	1.37	242	1.68	398	2.61	987	5.60	3,234
29	1.83	70	1.25	202	1.36	238	1.70	408	2.55	942	5.35	3,097
30	1.84	76			1.36	238	1.81	468	2.95	1,250		2,566 ^e
31	1.84	84			1.35	235			2.64	1,002		

^a Gauge height interpolated.^{b-b} Ice conditions.^e Discharge estimated.^g Ice going out.^{s-s} Shifting conditions.

MONTHLY DISCHARGE of Belly river near Stand Off, for 1915

(Drainage area 461 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	82	55	67	0.145	0.17	4,120
February.....	62	54	57	0.124	0.13	3,166
March.....	200	49	100	0.217	0.25	6,149
April.....	514	154	274	0.594	0.66	16,304
May.....	1,231	413	679	1.472	1.70	41,750
June.....	2,700	570	1,401	3.039	3.39	83,305
July.....	1,939	442	870	1.887	2.18	53,494
August.....	2,100	302	578	1.254	1.44	35,540
September.....	1,210	302	452	0.980	1.09	26,896
October.....	681	333	437	0.948	1.09	26,870
November.....	328	153	244	0.529	0.59	14,519
December.....	141	45	81	0.176	0.20	4,980
The year.....					12.89	317,093

This table is inserted in this report to correct a table which was published on page 267 of the report for 1915. The total run-off in acre-feet for the month of April was incorrect, but the balance of the table, as then published, was correct.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Belly river near Stand Off, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	4.00	2,036	1.95	503	1.65	348	1.19	184	1.13	167	1.15	106
2....	4.84	2,696	1.93	491	1.65	348	1.19	184	1.13	167	1.19	104
3....	4.61	2,516	1.96	509	1.74	388	1.19	184	1.15	173	1.23	100
4....	4.04	2,067	1.96	509	2.03	551	1.18	181	1.15	173	1.23	98
5....	3.64	1,753	1.91	480	2.30	726	1.15	173	1.15	173	1.11	96
6....	3.46	1,611	1.87	457	2.19	652	1.16	176	1.13	167	1.19	95
7....	3.37	1,542	1.84	440	2.08	582	1.18	181	1.08	154	1.09	95
8....	3.38	1,548	1.88	462	1.95	503	1.09	157	1.07	152	1.09	94
9....	3.43	1,588	2.12	607	1.91	480	1.08	154	1.06	149	1.10	93
10....	3.51	1,651	2.29	719	1.83	434	1.07	152	1.03	143	1.08	93
11....	3.47	1,620	2.23	679	1.73	384	1.07	152	0.89	112	1.10	93
12....	3.34	1,517	2.09	588	1.59	323	1.07	152	0.89	112	1.15	94
13....	3.25	1,446	1.99	527	1.53	299	1.06	149	0.92	118	1.32	94
14....	3.27	1,462	1.93	491	1.46	274	1.07	152	0.966	119	1.32	95
15....	3.03	1,274	1.90	474	1.44	266	1.06	149	0.94	119	1.32	95
16....	2.86	1,141	1.85	445	1.40	252	1.05	147	1.10	119	1.36	94
17....	2.83	1,117	1.87	457	1.39	249	1.09	157	1.51	119	1.37	91
18....	2.85	1,133	1.96	509	1.34	232	1.13	167	1.50	118	1.27	88
19....	2.67	994	1.98	521	1.30	218	1.09	157	1.45	118	1.31	86
20....	2.53	891	1.92	486	1.29	215	1.09	157	1.25	118	1.38	84
21....	2.42	811	1.83	434	1.29	215	1.11	162	1.17	118	1.31	81
22....	2.37	775	1.78	408	1.26	205	1.18	181	1.40	118	1.36	78
23....	2.37	775	1.77	403	1.27	208	1.14	170	1.31	118	1.49	76
24....	2.32	740	1.69	366	1.24	199	1.12	166	1.17	118	1.55	73
25....	2.25	692	1.70	370	1.23	196	1.09	157	1.08	118	1.52	71
26....	2.18	646	1.72	379	1.22	193	1.09	157	1.18	117	1.47	68
27....	2.17	639	1.76	398	1.20	187	1.13	167	1.18	116	1.42	66
28....	2.09	588	1.74	388	1.19	184	1.18	181	1.05	114	2.04	64
29....	2.05	563	1.71	375	1.19	184	1.17	179	1.09	112	1.87	61
30....	2.02	545	1.68	361	1.19	184	1.15	173	1.11	109	1.85	60
31....	1.98	521	1.67	357	.....	.....	1.13	167	.....	.....	1.726	60

b-b Ice conditions, November 14 to December 31.

MONTHLY DISCHARGE of Belly river near Stand Off, for 1916

(Drainage area 461 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	84	44	59	0.128	0.15	3,628
February.....	1,750	92	365	0.792	0.85	20,995
March.....	677	125	355	0.770	0.89	21,828
April.....	575	252	337	0.731	0.82	20,053
May.....	1,250	398	716	1.553	1.79	44,625
June.....	3,294	672	1,768	3.835	4.28	105,203
July.....	2,696	521	1,255	2.722	3.14	77,167
August.....	719	357	471	1.021	1.18	28,960
September.....	726	184	323	0.701	0.78	19,220
October.....	184	147	165	0.358	0.41	10,145
November.....	173	109	132	0.286	0.32	7,855
December.....	106	60	85	0.184	0.21	5,226
The year.....	.....	.....	.....	.....	14.82	364,305

MEAN MONTHLY DISCHARGE in Second-feet of Belly river near Stand Off

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		189	494	266	227	204	450	437	165	304	18,698
November.....				128 ^c	249	156	251	244	132	206	12,282
December.....				127 ^d		128	78	81	85	93	5,718
January.....				61	78	93	67	59		69	4,244
February.....				88	75	67	50	57		117	6,047
March.....				394 ^b	57 ^e	81	98	100	355	158	9,741
April.....		788	298	297 ^f	427	357	274	337		414	24,602
May.....	2,087 ^a	852	1,043	860	810	872	679	716		833	51,222
June.....	2,519	682	1,454	851	1,391	888	1,401	1,768		1,369	81,467
July.....	1,134	439	641	675	706	571	870	1,255		786	48,264
August.....	608	220	534	321	457	320	578	471		439	26,975
September.....	268	411	955	171	186	256	452	323		378	22,475
Total in Acre-feet	297,779	216,448	356,784	217,237	281,491	241,935	318,125	387,448			312,335

^a 26-31.^b 1-18 and 24-31.^c 1-4 and 27-30.^d 1-13.^e 1-24.^f 16-30.

ST. MARY RIVER DRAINAGE BASIN

General Description

St. Mary river, an important tributary of the Oldman river, and thus indirectly of the South Saskatchewan river, heads in northern Montana on the eastern slope of the main range of the Rocky mountains. It starts from the great Blackfoot glacier and receives affluents from numerous lesser glaciers. These streams unite within a short distance from their source and flow into Upper St. Mary lake. Below this lake and in close proximity, is lower St. Mary lake, the aggregate lengths of the two being about 22 miles. The river flows out of the lower lake, at an elevation of 4,460 feet above mean sea-level, and takes a northerly course through the foot-hills to the international boundary. From the boundary it flows in a north and easterly direction, through a rolling country, finally emptying into the Oldman river near Lethbridge, Alberta.

The basin is bounded on the south by the Rocky mountains, on the west by the watershed between Belly and St. Mary rivers and on the east by the watershed between Milk and St. Mary rivers. The upper portion of the basin is heavily timbered and receives its precipitation mostly in the shape of snowfall; the lower and major portion is totally devoid of tree growth and has a small precipitation.

The river flows through a very deep valley having steep banks, making the diversion of water from this stream for irrigation, an expensive undertaking. In Canada the Alberta Railway and Irrigation Company has water rights on this river. The headgate of their canal is at Kimball, five miles north of the boundary, and they already have many miles of ditch constructed, which irrigates land surrounding Lethbridge.

As this is an international river, discharge measurements are taken on it by both the Canadian and American Governments. The engineers of both countries use a common gauging station near Kimball.

FIDLER BROTHERS DITCH FROM BOUNDARY CREEK

Location.—On the SE. $\frac{1}{4}$ Sec. 19, Tp. 1, Rge. 26, W. 4th Mer.

Records available.—September 13, 1911, to July 13, 1914.

Gauge.—Vertical staff; zero of gauge 96.10 feet. Gauge not read during 1915-16.

Bench-marks.—Wooden plug on the left bank, eight feet west of the gauge; assumed elevation 100.00 feet.

Channel.—Permanent.

Discharge measurements.—Made by current-meter.

Observer.—Jas. Fidler.

Remarks.—Ditch not used during 1915 and 1916.

SESSIONAL PAPER NO. 25B

BOUNDARY CREEK AT FIDLER BROTHERS' RANCH

Location.—On the SW. $\frac{1}{4}$ Sec. 20, T_p. 1, R_{ge}. 26, W. 4th Mer.

Records available.—June 18, 1913, to October 31, 1916.

Gauge.—Vertical staff. Zero of gauge maintained at 96.98 feet during 1913. Zero of gauge maintained at 95.06 feet during 1914-16.

Bench-mark.—Permanent iron bench-mark located 25 feet from edge of left bank and 20 feet down stream from the gauge; assumed elevation 100.00 feet.

Channel.—Consists of fine gravel, stone and clay; not liable to shift.

Discharge measurements.—Made with current-meter, at low stages by wading and from temporary foot-bridge at higher stages.

Winter flow.—Records have not been obtained during the winter season.

Observer.—James Fidler.

DISCHARGE MEASUREMENTS of Boundary creek at Fidler Brothers' ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 15.....	S. H. Frame.....	16.0	17.3	1.82	1.78	32.0
May 13.....	do.....	16.0	18.9	1.69	1.78	32.0
June 17.....	do.....	17.0	20.5	1.94	1.96	40.0
July 21.....	do.....	16.0	13.8	1.14	1.65	18.7
Aug. 22.....	do.....	15.0	11.8	0.98	1.49	11.6
Sept. 25.....	do.....	15.0	10.6	0.62	1.40	6.6

DAILY GAUGE HEIGHT AND DISCHARGE of Boundary creek at Fidler Brothers' ranch, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			1.85	34.0	1.72	23	2.28	79
2.....			1.87	35.0	1.74	25	2.28	79
3.....			1.85	34.0	1.76	26	2.22	72
4.....			1.83	32.0	1.76	26	2.20	70
5.....			1.81	30.0	1.77	27	2.26	77
6.....			1.82	31.0	1.78	28	2.28	79
7.....			1.81	30.0	1.78	28	2.26	77
8.....			1.79	29.0	1.76	26	2.22	72
9.....			1.78	28.0	1.75	26	2.24	74
10.....			1.77	27.0	1.74	25	2.27	78
11.....			1.76	26.0	1.72	23	2.29	80
12.....			1.75	26.0	1.74	25	2.24	74
13.....			1.75	26.0	1.78	28	2.09	58
14.....			1.77	27.0	1.80	30	2.06	54
15.....			1.78	28.0	1.82	31	2.01	49
16.....			1.72	23.0	1.83	32	1.96	44
17.....			1.71	23.0	1.82	31	1.96	44
18.....			1.70	22.0	1.81	30	1.89	37
19.....			1.69	21.0	1.79	29	1.92	40
20.....			1.68	21.0	1.78	28	1.95	43
21.....			1.67	20.0	1.79	29	2.02	50
22.....			1.66	19.4	1.82	31	2.01	49
23.....			1.66	19.4	1.84	33	1.99	47
24.....			1.66	19.4	1.87	35	1.95	43
25.....			1.68	21.0	1.90	38	1.91	39
26.....			1.68	21.0	1.93	41	1.98	46
27.....	1.97	45	1.69	21.0	1.96	44	2.13	62
28.....	1.95	43	1.70	22.0	1.99	47	2.13	62
29.....	1.93	41	1.71	23.0	2.05	53	2.17	67
30.....	1.89	37	1.72	23.0	2.09	58	2.16	66
31.....	1.86	35			2.18	68		

DAILY GAUGE HEIGHT AND DISCHARGE of Boundary creek at Fidler Brothers' ranch, for 1916
—Concluded

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	2 06	54.0	1.57	14.4	1.44	8.5	1.48	10.1
2	2 04	52.0	1.55	13.4	1.44	8.5	1.49	10.5
3	1.99	47.0	1.54	12.9	1.47	9.7	1.53	12.4
4	1.94	42.0	1.52	12.0	1.50	11.0	1.56	13.9
5	1.89	37.0	1.50	11.0	1.53	12.4	1.58	15.0
6	1.86	34.0	1.49	10.5	1.54	12.9	1.55	13.4
7	1.85	34.0	1.48	10.1	1.56	13.9	1.55	13.4
8	1.84	33.0	1.47	9.7	1.56	13.9	1.54	12.9
9	1.84	33.0	1.51	11.5	1.57	14.4	1.53	12.4
10	1.84	33.0	1.55	13.4	1.56	13.9	1.52	12.0
11	1.80	30.0	1.59	15.5	1.54	12.9	1.52	12.0
12	1.78	28.0	1.63	17.6	1.56	13.9	1.51	11.5
13	1.76	26.0	1.66	19.4	1.58	15.0	1.52	12.0
14	1.73	24.0	1.64	18.2	1.58	15.0	1.54	12.9
15	1.70	22.0	1.61	16.5	1.56	13.9	1.54	12.9
16	1.69	21.0	1.58	15.0	1.56	13.9	1.56	13.9
17	1.70	22.0	1.56	13.9	1.54	12.9	1.56	13.9
18	1.72	23.0	1.60	16.0	1.52	12.0	1.58	15.0
19	1.70	22.0	1.62	17.1	1.50	11.0	1.58	15.0
20	1.68	21.0	1.53	12.4	1.48	10.1	1.60	16.0
21	1.65	18.7	1.50	11.0	1.45	8.9	1.62	17.1
22	1.64	18.2	1.49	10.5	1.44	8.5	1.62	17.1
23	1.63	17.6	1.48	10.1	1.43	8.2	1.64	18.2
24	1.62	17.1	1.46	9.3	1.42	7.8	1.64	18.2
25	1.60	16.0	1.46	9.3	1.40	7.1	1.60	16.0
26	1.61	16.5	1.45	8.9	1.44	8.5	1.56	13.9
27	1.62	17.1	1.44	8.5	1.45	8.9	1.56	13.9
28	1.64	18.2	1.44	8.5	1.44	8.5	1.57	14.4
29	1.62	17.1	1.42	7.8	1.46	9.3	1.56	13.9
30	1.60	16.0	1.42	7.8	1.47	9.7	1.56	13.9
31	1.59	15.5	1.42	7.8	.....	.....	1.55	13.4

MONTHLY DISCHARGE of Boundary creek at Fidler Brothers' ranch, for 1916

(Drainage area 44 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (27-31)	45.0	35.0	40.0	0.909	0.17	397
April	35.0	19.4	25.0	0.568	0.63	1,488
May	68.0	23.0	33.0	0.750	0.86	2,029
June	80.0	37.0	60.0	1.360	1.52	3,570
July	54.0	15.5	27.0	0.614	0.71	1,660
August	19.4	7.8	12.3	0.280	0.32	756
September	15.0	7.1	11.2	0.255	0.28	666
October	18.2	10.1	14.0	0.318	0.37	861
The period					4.86	11,427

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE of Boundary creek at Fidler Brothers' ranch

Area of watershed 44 square miles
Average run-off per square mile 234.9 acre-feet

YEAR	Mar. Sec.-ft.	April Sec.-ft.	May Sec.-ft.	June Sec.-ft.	July Sec.-ft.	Aug. Sec.-ft.	Sept. Sec.-ft.	Oct. Sec.-ft.	Nov. Sec.-ft.	Total Acre-ft.
1913.....				22a	13	11	9	10	9	3,742a
1914.....		14	17	9	4	3	4	12		3,798
1915.....	17a	16	28	88	55	29	25	25		16,534
1916.....	40a	25	33	60	27	12	11	14		11,427
Average sec.-ft.		18	26	52	25	14	12	15	9	10,586
Average acre-ft.		1,071	1,599	3,094	1,537	861	714	922	536	10,334

a Records incomplete, not included in average.

ST. MARY RIVER NEAR KIMBALL

Location.—On the NW. $\frac{1}{4}$ Sec. 25, Tp. 1, Rge. 25, W. 4th Mer., one mile above the Alberta Railway and Irrigation Company's dam.

Records available.—April 13, 1908, to November 31, 1916.

Gauges.—Stevens continuous water stage recorder, housed in a concrete shelter, about 3,000 feet above the cable installed in 1912; zero of which has been maintained at 88.75 feet, determined on November 17, to be 3,903.38 feet above mean sea-level.

Vertical staff at cable, the zero of staff which has been maintained at 85.84 feet during 1914-1916, determined on November 10 to be 3,904.24 feet above mean sea-level.

Chain gauge located on the bridge on the SW. $\frac{1}{4}$ Sec. 1, Tp. 2, Rge. 25, W. 4th Mer., zero of which was maintained at 86.97 feet during 1914-15.

The vertical staff at cable, and the chain gauge at the bridge, were read by J. M. Dunn.

Bench-marks.—For automatic gauge; a spike on the downstream side of the concrete shelter; assumed elevation 100.00 feet was, on November 17, found to be 3,914.63 feet above mean sea-level.

For staff gauge at cable, a permanent iron bench-mark, formerly assumed elevation of 100.00 feet, by irrigation surveys, has an elevation 3,904.24 feet above mean sea-level.

For chain gauge a permanent iron bench-mark; assumed elevation 100.00 feet; located 131 feet northeast of the right abutment of the bridge.

Channel.—Consists of sand and gravel. High waters created a shifting control during most of year, the greatest change occurring in June.

Discharge measurements.—Made from cable car on NE. $\frac{1}{4}$ Sec. 25, Tp. 1, Rge. 25, W. 4th Mer., and by wading in conjunction with measurements from cable car, when water is low enough.

Winter flow.—Difficulty is often experienced in obtaining accurate discharge during the winter months owing to slush-ice, and the formation of more than one layer of ice. Measurements during this season are, therefore, taken at the SW. $\frac{1}{4}$ Sec. 1, Tp. 2, Rge. 25, W. 4th Mer.

Diversions.—Alberta Railway and Irrigation Company's canal capacity about 900 second-feet, about one-half mile below the station.

Accuracy.—Stage-discharge relation permanent except during periods of high water and ice. Rating curve well defined between March 24 and April 9 and between June 24 and November 10. Between April 10 and June 23, shifting control, Bolster method applied. The operation of the Stevens water stage recorder, in use from April 10 to November 9, was satisfactory. Under ice conditions gauge read daily to one one-hundredths of a foot.

Daily discharge from January 1 to March 24, and from November 11 to December 31, ascertained from hydrograph derived from mean daily gauge height, discharge measurements and temperatures; between March 24 and April 9, by applying direct to curve plotted from readings of vertical staff at cable; Bolster method used between April 10 and June 23, and by direct application to rating table for remainder of year.

Remarks.—The United States Reclamation Service diverted 10,562 acre-feet from St. Mary river between August 1 and September 13, 1916. About 1,528 acre-feet reached the North Branch of Milk river and most of the balance returned by seepage and overflow to St. Mary river.

This station is maintained in co-operation with the stream measurement work carried on by the United States Geological Survey.

In the fall of 1916, the cable was moved to a new site, in NE. $\frac{1}{4}$ Sec. 23, Tp. 1, Rge. 25, W. 4th Mer., and gaugings will in future be made there during open water. The water stage recorder is also to be moved to a new shelter in SW. $\frac{1}{4}$ Sec. 25, Tp. 1, Rge. 25, W. 4th Mer.

DISCHARGE MEASUREMENTS of St. Mary river near Kimball, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 10.....	W. H. Storey.....	69.0	92.4	1.62	4.55c	149
Jan. 12.....	do.....	68.0	80.2	1.86	4.53	149
Feb. 10.....	V. A. Newhall.....	40.0	53.2	4.31	5.07	230
Feb. 12.....	do.....	40.0	56.0	4.04	4.97	226
Mar. 15.....	S. H. Frame.....	363.0	193.6	2.63	5.17c	509e
Mar. 23.....	do.....	101.4	183.4	3.22	3.40s	589
Mar. 24.....	do.....	175.0	259.3	2.09	3.27	542
Mar. 24.....	do.....	101.0	184.0	3.37	3.27	621
April 5.....	do.....	173.0	257.0	2.11	3.26s	543
April 24.....	do.....	183.0	290.2	2.32	2.66a	672
April 25.....	W. A. Lamb (U.S.G.S.).....	178.0	290.0	2.40	2.61	696
May 23.....	do.....	227.0	473.0	3.62	3.61	1,710
May 30.....	S. H. Frame.....	228.0	523.9	3.81	3.95	1,999
June 3.....	do.....	228.0	491.0	3.60	3.75	1,769
June 10.....	A. H. Tuttle (U.S.G.S.).....	231.0	746.0	4.10	5.00	3,060
June 20.....	S. H. Frame.....	224.0	1,082.0	7.02	7.07	7,817
June 23.....	do.....	231.0	1,135.8	6.71	7.60	7,844
June 26.....	do.....	213.0	819.0	5.68	6.20	4,903
June 26.....	A. H. Tuttle (U.S.G.S.).....	213.0	819.0	5.75	6.25	4,960
July 5.....	S. H. Frame.....	217.0	857.2	6.00	6.40	5,393
July 11.....	do.....	210.0	714.3	5.79	5.80	4,132
July 18.....	W. A. Lamb (U.S.G.S.).....	161.0	548.0	5.17	5.10	3,084
July 26.....	S. H. Frame.....	158.0	409.0	3.83	4.16	1,817
Aug. 16.....	do.....	228.0	359.9	3.25	3.42	1,169
Sept. 4.....	do.....	230.0	396.6	3.51	3.67	1,394
Sept. 8.....	do.....	231.0	461.9	3.71	4.01	1,714
Sept. 26.....	do.....	145.0	235.1	2.46	2.65	578
Sept. 29.....	do.....	143.0	224.8	2.27	2.56	511
Oct. 18.....	do.....	126.0	197.9	1.73	2.22a	342
Nov. 17.....	do.....	108.0	190.1	2.32	4.25c	440
Nov. 18.....	W. A. Lamb (U.S.G.S.).....	102.0	186.0	2.25	4.28	418
Dec. 11.....	H. W. Rowley.....	90.0	133.8	1.57	3.95c	210

e Discharge estimated; A.R. & I. dam as weir.

c-c Chain gauge, Jan. 10 to Mar. 15; Nov. 17 to Dec. 11.

s Staff gauge at cable.

a-a Automatic gauge.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of St. Mary river near Kimball, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	4.12 _x	150	4.68	232	6.03	617	3.41	658	3.08	1,080	3.93	1,980
2....		150 ^b	4.64	221	6.10	600	3.41	658	3.17	1,165	3.92	1,960
3....	4.50	152	4.75	218	6.15	583	3.38	630	3.15	1,150	3.78	1,800
4....	4.60	153	4.85	217	6.15	568	3.31	580	3.17	1,175	3.81	1,770
5....	4.75	154	4.75	218		555 ^b	3.25	532	3.24	1,240	4.11	2,050
6....	4.60	154		219 ^b	6.00	546	3.24	530	3.47	1,450	4.36	2,320
7....	4.57	153	4.96	222	6.64	539	3.26	543	3.87	1,865	4.41	2,340
8....	4.55	151	5.01	228	5.49	534	3.28	560	4.13	2,170	4.44	2,340
9....		149 ^b	4.98	230	6.14	529		575 ^e	4.18	2,260	4.58	2,500
10....	4.55	149	5.07	230	6.99	525	2.55 _x	590	4.18	2,260	4.91	2,930
11....	4.50	149	5.02	228	5.99	521	2.66	672	4.04	2,100	5.28	3,480
12....	4.53	149	4.97	226	5.78	519	2.66	672	3.91	1,960	5.29	3,560
13....	4.44	149		240 ^b	4.78	516	2.67	680	3.75	1,795	5.26	3,560
14....	4.45	150	5.12	274		512 ^b	2.70	700	3.64	1,680	5.27	3,640
15....	4.35	154	6.02	313	5.17	509	2.67	680	3.55	1,600	5.52	4,120
16....		157 ^b	6.77	358		512 ^b	2.74	740	3.46	1,530	6.05	5,240
17....	4.30	159	7.16	420	4.78	514	2.63	650	3.37	1,440	6.56	6,420
18....	4.35	165	6.11	480	4.58	516	2.67	680	3.32	1,390	6.72	6,880
19....	4.40	171		524 ^b	4.23	520	2.63	650	3.31	1,390	7.04	7,660
20....	4.50	178	5.81	565	4.14	524	2.66	672	3.32	1,400	7.07	7,817
21....		191 ^b	5.71	601	4.14	528	2.69	690	3.41	1,495	7.57	8,520
22....	4.55	208	5.47	628	4.09	532	2.73	725	3.52	1,600	7.80	8,620
23....		225 ^b	5.10	650	4.09	538	2.66	672	3.59	1,690	7.60	7,844
24....	4.50	241	5.15	669	3.27 _x	541	2.66	672	3.71	1,805	6.67	5,890
25....	4.30	255	4.98	670		615	2.61	696	3.89	1,990	6.23	4,966
26....		260 ^b	5.00	664		618 ^b	2.55	660	3.99	2,100	6.24	4,987
27....	4.55	261		654 ^b	3.37	620	2.56	660	4.04	2,140	6.30	5,113
28....	4.70	260	5.20	641	3.37	620	2.65	740	3.95	2,030	6.47	5,470
29....	4.75	256	5.20	630	3.36	615	2.75	810	3.91	1,960	6.97	6,520
30....		250 ^b			3.36	615	2.92	945	3.95	1,999	7.07	6,730
31....	4.60	242			3.37	620			3.95	2,000		

^b Discharge from winter hydrograph; ice conditions, Jan. 1 to Mar. 23; Nov. 11 to Dec. 31.^e Discharge estimated.^x Chain gauge at bridge, Jan. 1 to Mar. 23; Nov. 10 to Dec. 31.

Staff gauge at cable, Mar. 24 to April 19.

Automatic gauge, April 10 to Nov. 9.

DAILY GAUGE HEIGHT AND DISCHARGE of St. Mary river near Kimball, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	6.74	6,037	3.78	1,481	3.19	964	2.48	473	2.25	357	3.60	285
2.....	6.65	5,848	3.73	1,433	3.19	964	2.46	462	2.31	385	3.65	274
3.....	6.67	5,890	3.73	1,433	3.30	1,053	2.45	457	2.33	394	.....	266
4.....	6.61	5,764	3.66	1,366	3.57	1,284	2.42	441	2.39	425	3.75	256
5.....	6.45	5,428	3.61	1,320	3.79	1,490	2.42	441	2.38	420	3.73	248
6.....	6.00	4,516	3.58	1,293	4.02	1,721	2.45	457	2.38	420	3.70	240
7.....	5.69	3,977	3.56	1,275	4.08	1,784	2.42	441	2.37	414	3.67	234
8.....	5.69	3,977	3.54	1,257	4.00	1,700	2.37	414	2.39	425	3.57	227
9.....	5.70	3,993	3.71	1,414	3.73	1,433	2.34	399	2.42	441	3.47	221
10.....	5.74	4,059	3.86	1,559	3.56	1,275	2.34	399	.....^x	444b	.....	215b
11.....	5.80	4,159	3.87	1,569	3.44	1,171	2.31	385	3.82	446	3.95	210
13.....	5.73	4,042	3.81	1,510	3.33	1,078	2.29	375	3.82	448	3.55	211
13.....	5.75	4,075	3.70	1,404	3.23	996	2.30	380	3.82	449	4.15	212
14.....	5.56	3,763	3.57	1,284	3.17	949	2.31	385	3.97	449	4.10	213
15.....	5.45	3,585	3.48	1,205	3.14	925	2.27	366	4.00	449	4.15	214
16.....	5.41	3,520	3.42	1,154	3.08	880	2.25	357	4.10	446	4.55	216
17.....	5.34	3,407	3.42	1,154	2.99	815	2.23	348	4.25	440	.....	218
18.....	5.28	3,312	3.48	1,205	2.91	759	2.22	344	4.25	418	4.65	219
19.....	5.14	3,101	3.44	1,171	2.86	724	2.23	348	.....	404b	4.95	221
20.....	4.97	2,865	3.42	1,154	2.79	675	2.25	357	4.30	395	.....	222
21.....	4.81	2,656	3.39	1,129	2.76	654	2.31	385	4.25	384	5.00	224
22.....	4.65	2,452	3.35	1,095	2.71	619	2.37	414	4.15	374	5.15	226
23.....	4.55	2,327	3.30	1,053	2.70	612	2.31	385	4.10	366	5.50	229
24.....	4.41	2,156	3.26	1,020	2.70	612	2.30	380	4.10	359	.....	231
25.....	4.29	2,016	3.22	988	2.67	592	2.26	362	4.05	350	5.60	232
26.....	4.16	1,870	3.31	1,061	2.65	578	2.25	357	4.05	343	5.65	235
27.....	4.15	1,859	3.30	1,053	2.62	558	2.25	357	4.00	337	5.70	238
28.....	4.10	1,805	3.28	1,037	2.60	544	2.21	339	4.00	324	5.70	240
29.....	4.01	1,710	3.26	1,020	2.56	519	2.22	344	3.60	308	5.55	242
30.....	3.94	1,639	3.24	1,004	2.51	490	2.21	339	3.65	295	5.65	242
31.....	3.84	1,539	3.22	988	.....	.....	2.28	371	.....	.....	.....	243b

^b Discharge from winter hydrograph; ice conditions, Jan. 1 to Mar. 23; Nov. 11 to Dec. 31.^c Discharge estimated.^x Chain gauge at bridge, Jan. 1 to Mar. 23; Nov. 10 to Dec. 31.

Staff gauge at cable, Mar. 24 to April 9.

Automatic gauge, April 10 to Nov. 9.

MONTHLY DISCHARGE of St. Mary river near Kimball, for 1916

(Drainage area 472 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	261	149	185	0.392	0.45	11,375
February.....	670	217	402	0.852	0.91	23,123
March.....	620	509	556	1.180	1.36	34,187
April.....	945	530	664	1.410	1.57	39,511
May.....	2,260	1,080	1,707	3.620	4.17	104,958
June.....	8,620	1,770	4,634	9.820	10.96	275,742
July.....	6,037	1,539	3,463	7.340	8.46	212,932
August.....	1,569	988	1,229	2.600	3.00	75,568
September.....	1,784	490	947	2.010	2.24	56,350
October.....	473	339	389	0.824	0.95	23,919
November.....	449	295	397	0.841	0.94	23,623
December.....	285	210	232	0.492	0.57	14,265
The year.....	.....	.....	.....	.....	35.58	895,553

MEAN MONTHLY DISCHARGE of St. Mary river at International Boundary and Kimball

(Area of Watershed, 452 sq. miles at Int. Bdy.; 472 sq. miles at Kimball)

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Acre.-ft.
1902									604	477	342		
1903						1,720	5,200	2,924	1,404	1,109	917	535	438
1904		a200	a200	935		2,022	2,794	1,860	931	420	213	a122	a157
1905	a90	a75	a171	295	1,215	2,461	1,642	847	371	772	298	a240	514,100
1906	a100	a95	a125	481	1,500	2,280	1,830	946	628	756	1,100	359	619,000
1907	a150	a200	a150	489	1,930	4,260	3,120	1,330	1,210	567	244	157	835,000
1908	a50	a100	a225	844	2,490	6,390	2,490	785	462	485	472	a125	900,000
1909					1,907	5,646	3,097	1,466	645	453	683		
1910	a150	a160	a530	1,190	2,320	2,240	1,170	580	553	1,040	742	293	664,000
1911	210	189	196	527	2,070	3,651	1,783	1,044	1,377	676	334	190	740,254
1912	171	138	130	493	1,966	2,295	1,644	882	547	423	496	246	571,741
1913	158	129	191	749	1,912	4,519	2,024	1,162	542	448	371	190	749,112
1914	128	101	184	637	2,230	2,331	1,430	719	584	841	702	256	614,631
1915	168	117	157	575	1,645	2,251	1,722	969	842	b579	b405	243	585,988
1916	185	402	556	664	1,707	4,634	3,463	1,229	947	389	397	232	895,553
Average													
Sec.-ft.	142	159	234	657	1,902	3,640	2,157	1,021	723	603	483	240	699,050
Average													
Acre-ft.	8,731	8,830	14,388	39,094	116,949	216,595	132,629	62,779	43,021	37,077	28,740	14,757	723,600

a Estimated or partly estimated.

b Subject to revision.

NOTE:—The above table summarizing the stream flow data for the St. Mary river, where it crosses the International Boundary, has been prepared from the United States Geological Survey records at their former gauging station near the boundary and from the records of the former Canadian gauging station near Kimball, together with the recent records gained at the joint station now maintained near the latter place by the representatives of the two Governments.

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of St. Mary river near Kimball

MONTH	1907-8	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October			453	1,114	676	423	448	841	579	389	615	37,838
November			4683	711	334	496	371	702	405	397	488	29,038
December					190	246	190	256	243	232	226	13,903
January				210	171	158	128	168	185		170	10,457
February				189	138	129	101	117	402		179	10,140
March				196	130	191	184	157	556		236	14,488
April		c505	1,068	527	493	749	637	575	664		673	40,066
May		1,906	2,206	2,070	1,966	1,912	2,230	1,645	1,707		1,955	120,224
June	a3,108	5,646	2,208	3,651	2,295	4,519	2,331	2,251	4,634		3,442	204,804
July	2,395	3,036	1,176	1,783	1,644	2,024	1,430	1,722	3,463		2,081	127,987
August	947	1,466	562	1,044	882	1,162	719	969	1,229		998	61,354
September	b529	645	544	1,377	547	542	584	842	947		754	44,835
Total in acre-ft.	287,044	777,092	524,786	777,974	574,177	758,454	566,714	620,571	908,387			715,134

a 21-30.

b 1-19.

c 26-30.

d 1-20.

ALBERTA RAILWAY AND IRRIGATION COMPANY'S CANAL AT KIMBALL

Location.—On the SE. $\frac{1}{4}$ Sec. 36, Tp. 1, Rge. 25, W. 4th Mer., at a concrete measuring section five hundred feet below the control gates at the intake of the A.R. & I. Co.'s canal.

Records available.—During irrigation season from April 27, 1915, to October 7, 1916.

Gauge.—Inclined staff, set in concrete slopes of $1\frac{1}{2}$ to 1. Graduations on staff developed for slopes of $1\frac{1}{2}$ to 1. Gauge read by W. D. Willgrass.

Channel.—Above and below section, stream bed is composed of loose gravel and boulders. At section bed is composed of mixed gravel, levelled and tamped. Stream bed not liable to shift as velocities are not excessive.

Discharge measurements.—Made from foot-bridge having a trussed-span of forty-four feet; one hand rail upstream side.

Artificial control.—The discharge is controlled by headgates five hundred feet above the measuring section.

Remarks.—This station serves to register the amount of water diverted from the St. Mary river at Kimball for the A.R. & I. Co.'s purposes. In wet seasons there is more water registered at the A.R. & I. Co.'s flume, six miles below the headgates, owing to ground water flowing into the canal, but in dry seasons the diversion from the St. Mary river is the sole source of supply.

DISCHARGE MEASUREMENTS of Alberta Railway and Irrigation Company's canal, at Kimball, for 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 25	S. H. Frame	29.2	50.7	2.23	1.92	113
May 30	do	29.9	56.3	2.30	2.10	129
June 20	do	32.4	82.2	2.73	2.87	225
June 23	do	32.3	80.9	2.69	2.91	218
June 26	do	33.2	88.8	2.85	3.13	254
July 5	do	33.0	88.3	2.88	3.16	254
July 11	do	33.0	88.8	2.88	3.15	256
July 26	do	33.2	88.1	2.83	3.14	250
Aug. 15	do	33.3	89.8	2.80	3.15	252
Sept. 4	do	33.0	88.1	2.85	3.13	251
Sept. 8	do	30.9	63.4	2.46	2.35	156
Sept. 21	W. A. Burton	30.5	63.4	2.33	2.35	148
Sept. 26	S. H. Frame	31.2	70.6	2.47	2.55	174
Sept 29	do	31.2	69.4	2.49	2.55	173

DAILY GAUGE HEIGHT AND DISCHARGE of Alberta Railway and Irrigation Company's canal
at Kimball, in 1916

DAY	April		May		June	
	Gauge Height	Dis- charge	Gauge Height	Dis- charge	Gauge Height	Dis- charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1			2.30	147	2.10	128
2			2.45	163	2.09	127
3			2.60	179	2.10	128
4			2.60	179	2.15	133
5			2.59	178	2.21	138
6			2.60	179	2.20	137
7			2.61	181	2.21	138
8			2.60	179	2.25	142
9			2.70	192	2.41	158
10			2.69	190	2.40	157
11			2.70	192	2.41	158
12			2.70	192	2.40	157
13			2.71	193	2.41	158
14			2.70	192	2.40	157
15			2.89	217	2.40	157
16			3.10	246	2.72	194
17			3.20	261	2.80	205
18			3.30	276	2.90	218
19			3.50	307	2.89	217
20			3.66	333	2.87	214
21			3.80	356	2.95	225
22			3.81	357	2.99	231
23			3.81	257	2.91	220
24			3.80	356	2.98	229
25	1.92 ^h	114	2.85	211	3.16	255
26	^h		1.90	112	3.13	251
27	^h		1.90	112	3.14	252
28	1.50 ^h	86	2.00	120	3.14	252
29	2.02	122	2.11	129	3.15	254
30	2.15	133	2.10	128	3.14	252
31			2.11	129		

^h Headgate opened April 25; April 28 to October 7.
Headgate closed April 26-27.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Alberta Railway and Irrigation Company's canal at Kimball, for 1916.—*Concluded.*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	3.14	252	3.16	255	3.16	255	2.55	174
2.....	3.15	254	3.15	254	3.15	254	2.55	174
3.....	3.16	255	3.15	254	3.16	255	2.55	174
4.....	3.16	255	3.15	254	3.13	251	2.55	174
5.....	3.16	255	3.15	254	2.35	152	2.30	147
6.....	3.16	255	3.15	254	1.95	116	2.05	124
7.....	3.14	252	3.15	254	2.35	152	2.05	124
8.....	3.15	254	3.14	252	2.35	152		
9.....	3.15	254	3.16	255	2.35	152		
10.....	3.15	254	3.15	254	2.35	152		
11.....	3.15	254	3.15	254	2.35	152		
12.....	3.14	252	3.15	254	2.35	152		
13.....	3.15	254	3.14	252	2.36	153		
14.....	3.15	254	3.15	254	2.34	151		
15.....	3.15	254	3.15	254	2.35	152		
16.....	3.15	254	3.15	254	2.35	152		
17.....	3.16	255	3.16	255	2.35	152		
18.....	3.15	254	3.15	254	2.35	152		
19.....	3.15	254	3.14	252	2.35	152		
20.....	3.15	254	3.15	254	2.35	152		
21.....	3.14	252	3.14	252	2.35	152		
22.....	3.16	255	3.16	255	2.60	179		
23.....	3.14	252	3.15	254	2.85	211		
24.....	3.15	254	3.15	254	2.85	211		
25.....	3.14	252	3.15	254	2.70	192		
26.....	3.14	252	3.15	254	2.55	174		
27.....	3.16	255	3.16	255	2.55	174		
28.....	3.15	254	3.14	252	2.55	174		
29.....	3.14	252	3.15	254	2.55	174		
30.....	3.15	254	3.15	254	2.55	174		
31.....	3.14	252	3.14	252				

A Headgate closed October 7.

MONTHLY DISCHARGE of Alberta Railway and Irrigation Company's canal at Kimball, for 1916

MONTH	DISCHARGE IN SECOND-FEET			RUN-OFF
	Maximum	Minimum	Mean	
				Total Discharge in Acre.-ft.
April (25-30).....	133	86	114	904
May.....	357	112	211	12,974
June.....	255	127	188	11,187
July.....	255	252	254	15,618
August.....	255	252	254	15,618
September.....	255	116	174	10,354
October (1-7).....	174	124	156	2,166
The period.....				68,821

ALBERTA RAILWAY AND IRRIGATION COMPANY'S CANAL NEAR KIMBALL

Location.—On the SE. $\frac{1}{4}$ Sec. 21, Tp. 2, Rge. 24, W. 4th Mer., at the flume over Rolph creek, constructed in 1914.

Records available.—During irrigation seasons from July 26, 1910, to October 7, 1916.

Gauge.—Vertical staff; zero level with bottom of flume at gauge. Gauge read by J. M. Dunn.

Channel.—Smooth plank flume 768 feet long.

Discharge measurements.—Made from a foot-bridge, spanning the flume at a point about midway from the ends.

Artificial control.—The discharge is controlled by headgates at Kimball about six miles above the flume.

DISCHARGE MEASUREMENTS of Alberta Railway and Irrigation Company's canal (flume) near Kimball, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq.-ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
June 2.....	S. H. Frame.....	27.0	53.1	2.31	1.95	123
June 24.....	do.....	27.0	71.0	3.09	2.53	219
July 27.....	do.....	27.0	72.9	3.40	2.67	248
Aug. 17.....	do.....	27.0	72.9	3.42	2.70	249
Sept. 5.....	do.....	27.0	72.9	3.34	2.70	244
Sept. 27.....	do.....	27.0	62.1	2.79	2.26	173

DAILY GAUGE HEIGHT AND DISCHARGE of Alberta Railway and Irrigation Company's canal (flume) near Kimball, for 1916

DAY	April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			2.12	149	1.95	123
2.....			2.10	146	1.95	123
3.....			2.27	174	1.95	123
4.....			2.28	175	1.95	123
5.....			2.28	175	2.04	137
6.....			2.28	175	2.00	130
7.....			2.28	175	2.00	130
8.....			2.30	179	2.05	138
9.....			2.35	187	2.20	162
10.....			2.35	187	2.16	156
11.....			2.35	187	2.15	154
12.....			2.35	187	2.15	154
13.....			2.35	187	2.15	154
14.....			2.35	187	2.15	154
15.....			2.65	240	2.15	154
16.....			2.60	231	2.30	179
17.....			2.60	231	2.38	192
18.....			2.75	239	2.50	213
19.....			2.93	295	2.50	213
20.....			2.93	295	2.50	213
21.....			3.15	340	2.40	196
22.....			3.15	340	2.55	222
23.....			3.15	340	2.50	213
24.....			3.15	340	2.53	218
25.....				221e	2.60	231
26.....			1.80	102	2.66	242
27.....			1.80	102	2.66	242
28.....	1.50h	68	1.95	123	2.68	246
29.....	2.03	135	1.95	123	2.68	246
30.....	1.90	116	1.95	123	2.65	240
31.....			1.95	123		

h Headgate opened April 28.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Alberta Railway and Irrigation Company's canal (flume) near Kimball, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	2.68	246	2.67	244	2.67	244	2.26	172 ^e
2	2.70	249	2.67	244	2.68	246	2.26	172
3	2.70	249	2.67	244	2.68	246	2.26	172
4	2.66	242	2.67	244	2.70	249	2.26	172
5	2.68	246	2.67	244	2.70	249	2.27	174
6	2.68	246	2.67	244	1.60	79	1.92	119
7	2.68	246	2.67	244	2.10	146	1.92 ^h	119
8	2.70	249	2.66	242	2.12	149		
9	2.68	246	2.67	244	2.12	149		
10	2.68	246	2.67	244	2.12	149 ^e		
11	2.69	246	2.67	244	2.12	149		
12	2.68	246	2.67	244	2.10	146		
13	2.68	246	2.67	244	2.12	149		
14	2.67	244	2.67	244	2.12	149		
15	2.68	246	2.67	244	2.12	149		
16	2.68	246	2.68	246	2.12	149		
17	2.68	246	2.70	249	2.12	149 ^e		
18	2.68	246	2.68	246	2.12	149		
19	2.67	244	2.67	244	2.12	149		
20	2.68	246	2.67	244	2.12	149		
21	2.68	246	2.67	244	2.12	149		
22	2.68	246	2.67	244	2.50	213		
23	2.68	246	2.67	244	2.50	213		
24	2.67	244	2.67	244	2.12	149		
25	2.68	246	2.67	244	2.50	213		
26	2.68	246	2.67	244	2.20	162		
27	2.67	244	2.67	244	2.26	172		
28	2.67	244	2.67	244	2.26	172		
29	2.67	244	2.67	244	2.26	172		
30	2.67	244	2.67	244	2.26	172		
31	2.67	244	2.68	246				

^h Headgate closed October 7.

MONTHLY DISCHARGE of Alberta Railway and Irrigation Company's canal (flume) near Kimball, for 1916

MONTH	DISCHARGE IN SECOND-FEET			Total Discharge in acre-ft.
	Maximum	Minimum	Mean	
April (28-30)	135	68	106	631
May	340	102	203	12,482
June	246	123	181	10,770
July	249	242	246	15,126
August	249	242	244	15,003
September	249	79	175	10,413
October (1-7)	174	119	157	2,179
The Period				66,604

MEAN MONTHLY DISCHARGE of Alberta Railway and Irrigation flume near Kimball

YEAR	April Sec.-ft.	May Sec.-ft.	June Sec.-ft.	July Sec.-ft.	Aug. Sec.-ft.	Sept. Sec.-ft.	Oct. Sec.-ft.	Total Acre-ft.	REMARKS
1910....	0	289	628	571	472	414	260b	146,999	(a) Reduced to monthly average.
1911....	204b	269	382	376	387	273	330b	117,950	
1912....	0	260	500	330	298	309	140b	103,295	(b) Partial months only.
1913....	0	262	526	351	381	340	326b	118,468	
1914....	283b	454	696	666	542	368	329b	170,538	
1915....	154b	323	312	222	195	243	231b	83,412	
1916....	106b	203	181	246	244	175	157b	66,604	
Average Sec.-ft.	17a	294	460	352	360	303	76a	115,372	
Average Acre-ft.	1,012	18,077	27,372	21,644	22,136	18,030	4,673	112,944	

ROLPH CREEK NEAR KIMBALL

Location.—On the SE. $\frac{1}{4}$ Sec. 21, Tp. 2, Rge. 24, W. 4th Mer.

Records available.—May 17, 1911, to October 31, 1916.

Gauge.—Vertical staff. Zero of gauge maintained at 93.41 feet during 1913-16.

Bench-mark.—Permanent iron bench-mark located on the left bank, 100.00 feet down stream from the gauge; assumed elevation 100.00 feet.

Channel.—Consists of sand, gravel and stone; likely to shift.

Discharge measurements.—Made with current-meter by wading.

Winter flow.—Records have not been obtained during the winter season.

Observer.—J. M. Dunn.

DISCHARGE MEASUREMENTS of Rolph creek near Kimball, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 6.....	S. H. Frame.....	15.6	11.9	2.08	1.30	25.0
June 2.....	do.....	34.5	35.3	2.64	1.75	93.0
June 24.....	do.....	20.0	15.6	2.00	1.27	31.0
July 27.....	do.....	12.0	7.5	0.87	0.97	6.5
Aug. 17.....	do.....	15.0	12.0	1.38	1.15	16.6
Sept. 5.....	do.....	23.0	22.0	2.70	1.57	60.0
Sept. 27.....	do.....	11.0	6.7	1.25	1.04	8.4

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Rolph creek near Kimball, for 1916

DAY	April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	1.40	38.0	1.15	14.9	1.75	93
2.....	1.35	35.0 ^e	1.20	18.5	1.75	93
3.....	1.35	32.0	1.22	20.0	1.75	93
4.....	1.32	30.0 ^e	1.20	18.5	1.75	79 ^e
5.....	1.32	29.0	1.18	17.1	1.60	64
6.....	1.30	27.0	1.15	14.9	2.00	150
7.....	1.30	27.0 ^e	1.10	13.5 ^e	1.75	93
8.....	1.30	27.0	1.10	12.1	1.60	64
9.....	1.28	26.0 ^e	1.10	12.1	1.56	58
10.....	1.28	25.0	1.08	11.1	1.50	50
11.....	1.20	22.0 ^e	1.05	9.6	1.48	49 ^e
12.....	1.20	18.5	1.05	9.6	1.48	48
13.....	1.16	17.0	1.05	9.6	1.47	46
14.....	1.16	15.6	1.05	9.6 ^e	1.45	44
15.....	1.15	14.9	1.05	9.6	1.40	38
16.....	1.15	14.9 ^e	1.05	9.6	1.30	27
17.....	1.15	14.9	1.05	9.6	1.25	22
18.....	1.15	14.9 ^e	1.05	9.6	1.25	22
19.....	1.15	14.9 ^e	1.05	9.6	1.25	22 ^e
20.....	1.15	14.9	1.05	9.6	1.25	22
21.....	1.15	14.9	1.05	9.6	1.27	24
22.....	1.15	14.9	1.08	11.1	1.35	32
23.....	1.15	14.9	1.10	12.1	1.30	27
24.....	1.15	14.9	1.20	18.5	1.27	24
25.....	1.12	13.2	1.20	18.5	1.27	24
26.....	1.10	12.1	1.75	93.0	1.28	25
27.....	1.10	12.1	1.75	93.0	1.30	27
28.....	1.10	12.1	1.70	82.0	1.85	116
29.....	1.12	13.2	1.68	79.0	1.75	93
30.....	1.12	13.2	1.90	127.0	2.05	161
31.....	1.12	13.2	1.85	116.0	2.05	161

^e Discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Rolph creek near Kimball, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	1.85	116.0	0.97	6.6	1.14	14.3	0.98	7.0
2.....	1.70	82.0	0.97	6.6	1.15	14.9	0.98	7.0
3.....	1.60	64.0	0.97	6.6	.....	21.0 ^e	0.98	7.0
4.....	1.50	50.0	0.97	6.6	1.30	27.0	0.95	6.0
5.....	1.40	38.0	0.97	6.6	1.57	60.0	0.98	7.0
6.....	1.30	27.0	.....	6.6 ^e	1.35	32.0	1.05	9.6
7.....	1.25	22.0	0.97	6.6	1.30	27.0	1.00	7.6
8.....	1.20	18.5	0.97	6.6	1.25	22.0	.....	9.8 ^e
9.....	1.15	14.9	1.15	14.9	1.20	18.5	1.10	12.1
10.....	1.15	14.9	1.30	27.0	.....	18.5 ^e	1.12	13.2
11.....	1.10	12.1	1.25	22.0	1.20	18.5	1.15	14.9
12.....	1.08	11.1	1.23	21.0	1.20	18.5	1.13	13.8
13.....	1.05	9.6	1.22	20.0	1.18	17.1	.....	13.5 ^e
14.....	1.03	8.8	1.20	18.5	1.16	15.6	1.12	13.2
15.....	0.97	6.6	1.18	17.1	1.15	14.9	.....	13.2 ^e
16.....	.....	6.6 ^e	1.18	17.1	1.15	14.9	1.12	13.2
17.....	0.97	6.6	1.15	14.9	.....	14.0 ^e	1.11	12.7
18.....	0.96	6.3	1.20	18.5	1.12	13.2	1.11	12.7
19.....	0.96	6.3	1.18	17.1	1.10	12.1	.....	12.4 ^e
20.....	0.96	6.3	1.16	15.6	1.10	12.1	1.10	12.1
21.....	0.95	6.0	1.15	14.9	1.10	12.1	1.10	12.1
22.....	0.94	5.8	1.14	14.3	1.10	12.1	1.10	12.1
23.....	.....	5.8 ^e	1.12	13.2	1.10	12.1	1.10	12.1
24.....	0.94	5.8	1.10	12.1	.....	12.1 ^e	1.10	12.1
25.....	0.94	5.8	1.10	12.1	1.10	12.1	1.12	13.2
26.....	0.95	6.0	1.10	12.1	1.10	12.1	1.12	13.2
27.....	0.97	6.6	1.10	12.1	1.04	9.2	1.12	13.2
28.....	0.97	6.6	1.10	12.1	1.00	7.6	1.11	12.7
29.....	0.97	6.6	1.10	12.1	0.98	7.0	.....	12.4 ^e
30.....	0.97	6.6	1.10	12.1	0.98	7.0	1.10	12.1
31.....	0.97	6.6	1.10	12.1	.....	.....	1.10	12.1

^e Discharge estimated.

MONTHLY DISCHARGE of Rolph creek near Kimball, for 1916

(Drainage area 74 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April.....	38.0	12.1	19.8	0.268	0.30	1,178
May.....	127.0	9.6	31.0	0.419	0.48	1,906
June.....	150.0	22.0	58.0	0.784	0.87	3,451
July.....	116.0	5.8	19.2	0.259	0.30	1,181
August.....	27.0	6.6	13.4	0.181	0.21	824
September.....	60.0	7.0	17.0	0.230	0.26	1,012
October.....	14.9	6.0	11.5	0.155	0.18	707
The period.....	.....	.....	.....	.....	2.60	10,259

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE of Rolph creek near Kimball

Area of Watershed 74 square miles
Average run-off per square mile 87.3 acre-feet

YEAR	Mar. Sec.-ft.	April Sec.-ft.	May Sec.-ft.	June Sec.-ft.	July Sec.-ft.	Aug. Sec.-ft.	Sept. Sec.-ft.	Oct. Sec.-ft.	Nov. Sec.-ft.	Total Acre-ft.
1911.....			39a	23	2	2	8	5	3	3,683
1912.....			11	2	6	2	1	4	4a	1,702
1913.....		36a	16	5	6	3	1	5		3,866
1914.....		18	4	0	0	1	0	12		2,129
1915.....	39b	10	12	82	40	31	24	16		13,761
1916.....		20	31	58	19	13	17	12		10,259
Average sec.-ft.....		20	19	28	12	9	8	9	2	5,900
Average acre-ft.....		1,190	1,168	1,666	738	553	476	553	119	6,463

a Reduced to monthly average.

b Partial month.

LEE CREEK AT LAYTON'S RANCH

Location.—On the SE. $\frac{1}{4}$ Sec. 27, Tp. 2, Rge. 26, W. 4th Mer., at B. Layton's ranch.

Records available.—May 25, 1913, to December 31, 1916.

Gauge.—Vertical staff from 1913 to June 6, 1915, zero maintained at 88.14; June 6, 1915, to October 13, 1916, zero maintained at 90.79. Open chain gauge installed October 14, 1916, with new zero of 91.24. Gauge read by B. Layton.

Bench-marks.—Permanent iron bench-mark, assumed elevation 100.00 feet, located on the left bank about fifty feet west of chain gauge.

Channel.—Straight and quite uniform with a flat rock and boulders bed, not liable to shift.

Discharge measurements.—Made by wading at all ordinary stages, and from a temporary cable at very high stages.

Winter flow.—Obtained through the ice 800 feet above the gauge.

Remarks.—The town of Cardston takes its water supply from this stream, the intake being about one-half mile below the gauging station.

DISCHARGE MEASUREMENTS of Lee creek at Layton's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 15.....	W. H. Storey.....	38.0	33.7	0.56	2.47b	19.0
Jan. 22.....	V. A. Newhall.....	34.0	21.0	0.98	2.17	21.0
Feb. 5.....	do.....	32.0	18.4	0.80	3.32	14.8
Mar. 4.....	do.....	31.0	19.4	1.23	3.01b	24.0
Mar. 31.....	S. H. Frame.....	42.0	50.4	1.88	1.70	94.0
April 21.....	do.....	48.0	60.2	2.05	1.84	123.0
May 12.....	do.....	58.0	70.1	2.36	1.93	165.0
July 7.....	do.....	66.0	92.4	2.88	2.30	265.0
July 22.....	W. A. Burton.....	49.0	56.2	1.61	1.63	90.0
Aug. 23.....	S. H. Frame.....	37.0	36.2	1.17	1.20	42.0
Sept. 19.....	do.....	39.5	36.3	0.99	1.18	36.0
Oct. 14.....	W. A. Burton.....	38.0	31.7	0.85	1.06	27.0
Nov. 22.....	S. H. Frame.....	38.0	85.4	1.24	1.25	44.0
Nov. 29.....	do.....	29.0	23.4	2.09	1.25b	49.0
Nov. 29.....	H. W. Rowley.....	22.0	15.6	1.41	1.12b	22.0
Dec. 18.....	do.....	18.0	24.6	1.02	1.54b	25.0

b Ice conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Lee creek at Layton's ranch, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	.....	18.4	2.67	8.6	3.00	21	1.78	114	1.90	141	2.87	470
2.....	2.01 ^b	18.5	2.77	9.3	2.87	22	1.76	111	2.12	202	2.78	438
3.....	2.06	19.0	2.92	10.8	2.87	23	1.72	104	2.14	209	2.75	427
4.....	2.09	19.5	3.12	12.8	3.01	24	1.70	100	2.16	215	2.75	427
5.....	2.09	20.0	3.32	14.8	2.92	27	1.68	97	2.20	229	2.70	409
6.....	2.10	21.0	3.02	16.2	2.82	32	1.72	104	2.22	236	2.70	409
7.....	2.10	21.0	2.84	17.2	3.02	40	1.79	116	2.45	319	2.75	427
8.....	2.13	20.0	2.77	18.4	.....	49	1.78	114	2.30	265	2.84	459
9.....	2.22	18.3	2.77	19.7	3.12	61	.....	114 ^e	2.25	247	2.90	481
10.....	.....	16.2	2.77	21.0	2.92	70	1.78	114	2.05	180	3.15	571
11.....	2.37	15.3	2.77	23.0	2.82	81	1.82	122	1.97	158	.....	326 ^e
12.....	2.44	15.4	2.77	26.0	2.62	92	1.85	129	1.93	148	2.90	481
13.....	2.48	16.2	2.62	29.0	2.22	107	1.90	141	1.93	148	2.80	445
14.....	2.52	17.8	2.52	44.0	1.97	116	1.97	158	.....	150 ^e	2.72	416
15.....	2.47	19.0	2.92	126.0	1.94	126	2.06	183	1.94	151	2.68	402
16.....	2.52	21.0	3.42	218.0	1.92	135	.....	174 ^e	1.95	153	2.65	391
17.....	2.52	22.0	4.62	300.0	1.90	148	2.00	166	1.90	141	2.70	409
18.....	2.54	23.0	4.32	245.0	1.87	157	1.94	151	1.87	134	2.75	427
19.....	2.57	23.0	4.02	190.0	1.85	161	1.90	141	1.84	127	2.73	420
20.....	2.42	23.0	3.80	132.0	1.82 ^b	161	1.87	134	1.88	136	2.70	409
21.....	2.27	22.0	3.62	75.0	1.98	161	1.84	127	1.90	141	2.65	391
22.....	2.17	21.0	3.42	38.0	1.92	146	1.84	127	1.96	156	2.60	373
23.....	2.17	19.7	3.52	31.0	1.87	134	1.85	129	2.04	177	2.55	355
24.....	2.20	17.7	3.27	27.0	1.82	122	1.88	136	2.50	337	2.42	308
25.....	2.24	15.6	3.02	25.0	1.72	104	1.94	151	2.60	373	2.70	409
26.....	2.29	13.8	2.87	23.0	1.72	104	1.90	141	2.73	420	2.90	481
27.....	2.32	12.2	.....	22.0	1.71	102	1.87	134	2.75	427	3.36	647
28.....	2.39	10.8	2.96	22.0	1.70	100	1.83	125	2.90	481	3.74	783
29.....	2.44	9.5	3.00	21.0	1.70	100	1.84	127	3.02	524	4.10	913
30.....	2.52	8.8	.....	.....	.....	100 ^e	1.85	129	2.98	510	3.90	841
31.....	2.57	8.5	.....	.....	1.70	100	.....	.....	3.00	517	.....	.....

b-b Ice conditions. Discharge taken from winter hydrograph.

c Discharge estimated.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Lee creek at Layton's ranch, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	607 ^a		1.27	45	1.18	37	1.00	24	1.18	37	1.14	21.0
2.....	2.60	373	1.24	42	1.22	41	1.00	24	1.18	37	1.14	21.0
3.....	2.58	366	1.22	41	1.25	43	1.05	27	1.20	39	1.15	21.0
4.....	2.56	359	1.21	40	1.23	41	1.07	29	1.20	39	1.17	22.0
5.....	2.52	344	1.20	39	1.21	40	1.08	29	1.18	37	1.18	23.0
6.....	2.48	330	1.19	38	1.20	39	1.08	29	1.18 ^b	34	1.21	24.0
7.....	2.30	265	1.18	37	1.20	39	1.08	29	1.15	29	1.25	25.0
8.....	2.33	276	1.30	48	1.20	39	1.15	35	1.15	27	1.28	26.0
9.....	2.23	240	1.77	113	1.19	38	1.18	37	1.15	27	1.32	26.0
10.....	2.15	212	1.68	97	1.19	38	1.18	37	1.15	27	1.38	27.0
11.....	2.05	180	1.62	87	1.18	37	1.17	37	1.20	28	1.44	28.0
12.....	2.00	166	1.53	74	1.18	37	1.16	36	1.28	30	1.50	28.0
13.....	1.97	158	1.46	65	1.17	37	1.15	35	1.40	34	1.50	28.0
14.....	1.92	146	1.40	58	1.17	37	1.25	43	1.38	37	1.51	28.0
15.....	1.88	136	1.32	50	1.16	36	1.23	41	1.38	40	1.51	28.0
16.....	1.85	129	1.29	47	1.15	35	1.20	39	.....	42	.....	27.0
17.....	1.82	122	1.28	46	1.13	33	1.20	39	1.42	45	1.52	26.0
18.....	1.90	118	1.26	44	1.11	32	1.20	39	1.40	47	1.54	25.0
19.....	1.76	111	1.25	43	1.06	28	1.20	39	1.38	48	1.55	24.0
20.....	1.72	104	1.24	42	1.08	29	1.19	38	1.32	49	1.58	23.0
21.....	1.70	100	1.23	41	1.07	29	1.19	38	1.28	49	1.60	23.0
22.....	1.63	89	1.22	41	1.07	29	1.18	37	1.25	49	1.60	22.0
23.....	1.62	87	1.20	39	1.05	27	1.18	37	1.23	46	1.56	21.0
24.....	1.58	81	1.19	38	1.04	26	1.18	37	.....	41	1.50	21.0
25.....	1.50	70	1.18	37	1.04	26	1.17	37	1.19	35	1.45	20.0
26.....	1.52	73	1.18	37	1.02	25	1.17	37	1.16	29	1.45	19.5
27.....	1.48	68	1.16	36	1.00	24	1.17	37	1.12	25	1.45	19.5
28.....	1.45	64	1.16	36	1.00	24	1.16	36	1.10	23	1.45	20.0
29.....	1.39	56	1.15	35	0.98	21	1.16	36	1.12	22	1.45	21.0
30.....	1.32	50	1.14	34	0.98	21	1.15	35	1.12	21	1.45	21.0
31.....	1.29	47	1.14	34	.....	.....	1.15	35	.....	.....	.....^b	21.0

^{b-b} Ice conditions. Discharge taken from winter hydrograph.^c Discharge estimated.

MONTHLY DISCHARGE of Lee creek at Layton's ranch, for 1916

(Drainage area 92 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	23	8.5	17.6	0.191	0.22	1,082
February.....	300	8.6	61.0	0.663	0.72	3,509
March.....	161	21.0	94.0	1.020	1.18	5,780
April.....	183	97.0	130.0	1.410	1.57	7,736
May.....	524	127.0	250.0	2.720	3.14	15,372
June.....	913	308.0	478.0	5.200	5.80	28,443
July.....	607	47.0	178.0	1.930	2.22	10,945
August.....	113	34.0	49.0	0.533	0.61	3,013
September.....	43	21.0	33.0	0.359	0.40	1,964
October.....	43	24.0	35.0	0.380	0.44	2,152
November.....	49	21.0	36.0	0.391	0.44	2,142
December.....	28	19.5	24.0	0.261	0.30	1,476
The year.....	.....	.....	.....	.....	17.04	83,614

MEAN MONTHLY DISCHARGE of Lee creek at Layton's ranch

(Area of watershed 92 square miles)
(Average run-off per square mile 623 acre-feet)

YEAR	Jan. Sec.-ft.	Feb. Sec.-ft.	Mar. Sec.-ft.	April Sec.-ft.	May Sec.-ft.	June Sec.-ft.	July Sec.-ft.	Aug. Sec.-ft.	Sept. Sec.-ft.	Oct. Sec.-ft.	Nov. Sec.-ft.	Dec. Sec.-ft.	Total Acre-ft.
1913.....					162	153	72	36	20	31	36	9	29,900 ^a
1914.....	15	9	21	82	127	94	34	20	17	65	60	17	33,900
1915.....	17	14	26	63	175	359	151	92	71	91	56	36	69,600
1916.....	18	61	94	130	250	478	178	49	33	35	36	24	83,614
Average Sec.-Ft.	17	28	47	92	178	271	109	49	35	55	47	21	62,371
Average Acre-ft.	1,045	1,555	2,890	5,474	10,945	16,126	6,702	3,013	2,083	3,382	2,797	1,291	57,303

^a Records incomplete, not included in average.

PINEPOUND CREEK NEAR SPRING COULEE (PACKARD'S FARM)

Location.—On the NE. $\frac{1}{4}$ Sec. 29, Tp. 4, Rge. 23, W. 4th Mer.

Records available.—April 30, 1914, to October 31, 1916.

Gauge.—Vertical staff. Zero of gauge maintained at elevation of 93.00 feet since established.

Gauge read by D. M. Boyd.

Bench-mark.—Permanent iron bench-mark located fifty feet northeast of the gauge; assumed elevation 100.00 feet.

Channel.—Composed of sand, gravel and small stones, not liable to shift on account of the good control located about 100 feet below the gauge.

Discharge measurements.—Made by wading.

Winter flow.—Station discontinued during winter season.

Remarks.—The greater portion of discharge is waste water from the Alberta Railway and Irrigation Company's canal.

DISCHARGE MEASUREMENTS of Pinepound creek near Spring Coulee (Packard's farm), in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
March 20.....	S. H. Frame.....	10.5	4.9	0.52	2.66	2.50 ^b
April 14.....	do.....	12.5	4.4	1.17	2.64	5.00
May 9.....	do.....	9.0	2.4	0.72	2.49	1.73
May 27.....	do.....	12.0	5.6	1.54	2.72	8.60
July 17.....	W. A. Burton.....	12.5	5.4	1.24	2.68	6.70
Aug. 21.....	S. H. Frame.....				2.34	0.09 ^w
Sept. 18.....	W. A. Burton.....				2.35	0.06 ^w
Oct. 9.....	S. H. Frame.....				2.35	0.16 ^w

^b Ice conditions.

^w Discharge determined by using a six-inch weir.

SESSIONAL PAPER No. 25a

DAILY GAUGE HEIGHT AND DISCHARGE of Pinepound creek near Spring Coulee (Packard's farm)
for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1			2.82	14.00	2.47	1.45	2.67	6.3
2			2.83	14.50	2.47	1.45	2.68	6.7
3			2.85	15.60	2.48	1.60	2.79	12.4
4			2.79	12.40	2.49	1.75	2.79	12.4
5			2.70	7.60	2.52	2.30	2.77	11.3
6			2.70	7.60	2.52	2.30	2.78	11.8
7			2.69	7.20	2.52	2.30	2.69	7.2
8			2.68	6.70	2.51	2.10	2.69	7.2
9			2.61	4.30	2.49	1.75	2.69	7.2
10			2.62	4.60	2.49	1.75	2.67	6.3
11			2.64	5.10	2.50	1.90	2.65	5.4
12			2.63	4.80	2.51	2.10	2.65	5.4
13			2.61	4.30	2.51	2.10	2.63	4.8
14			2.64	5.10	2.52	2.30	2.62	4.6
15			2.61	4.30	2.50	1.90	2.62	4.6
16			2.62	4.60	2.50	1.90	2.63	4.8
17			2.61	4.30	2.50	1.90	2.63	4.8
18			2.60	4.00	2.51	2.10	2.65	5.4
19			2.59	3.80	2.51	2.10	2.70	7.6
20	2.666	5.0	2.56	3.00	2.50	1.90	2.69	7.2
21	3.08	25.0	2.57	3.30	2.50	1.90	2.68	6.7
22	2.95	20.0	2.56	3.00	2.51	2.10	2.70	7.6
23	2.89b	15.0	2.55	2.80	2.52	2.30	2.65	5.4
24	2.83	14.5	2.53	2.40	2.59	3.80	2.67	6.3
25	2.76	10.7	2.52	2.30	2.61	4.30	2.66	5.8
26	2.75	10.2	2.52	2.30	2.69	7.20	2.66	5.8
27	2.78	11.8	2.53	2.40	2.72	8.60	2.64	5.1
28	2.74	9.7	2.52	2.30	2.71	8.10	2.66	5.8
29	2.80	12.9	2.50	1.90	2.70	7.60	2.66	5.8
30	2.81	13.4	2.48	1.60	2.72	8.60	2.55	2.8
31	2.86	16.1			2.65	5.40		

b-b Ice conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Pinepound creek near Spring Coulee (Packard's farm),
for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	2.54	2.60	2.51	2.10	2.39	0.46	2.41	0.67
2	2.40	0.55	2.51	2.10	2.40	0.55	2.40	0.55
3	2.40	0.55	2.53	2.40	2.39	0.46	2.41	0.67
4	2.39	0.46	2.54	2.60	2.39	0.46	2.43	0.91
5	2.39	0.46	2.53	2.40	2.40	0.55	2.44	1.03
6	2.49	1.75	2.53	2.40	2.40	0.55	2.43	0.91
7	2.49	1.75	2.53	2.40	2.39	0.46	2.40	0.55
8	2.49	1.75	2.54	2.60	2.40	0.55	2.41	0.67
9	2.49	1.75	2.54	2.60	2.40	0.55	2.35	0.12
10	2.49	1.75	2.55	2.80	2.38	0.38	2.37	0.29
11	2.50	1.90	2.54	2.60	2.38	0.38	2.38	0.38
12	2.50	1.90	2.54	2.60	2.39	0.46	2.38	0.38
13	2.55	2.80	2.56	3.00	2.39	0.46	2.38	0.38
14	2.61	4.30	2.57	3.30	2.40	0.55	2.41	0.67
15	2.63	4.80	.....	1.03e	2.40	0.55	2.42	0.79
16	2.64	5.10	.....	0.48e	2.40	0.55	2.40	0.55
17	2.68	6.70	2.19	Nil	2.40	0.55	2.40	0.55
18	2.69	7.20	2.19	"	2.35	0.12	2.41	0.67
19	2.68	6.70	2.19	"	2.40	0.55	2.39	0.46
20	2.67	6.30	2.38	0.38	2.40	0.55	2.40	0.55
21	2.66	5.80	2.34	0.10	2.40	0.55	2.40	0.55
22	2.66	5.80	2.35	0.12	2.40	0.55	2.39	0.46
23	2.67	6.30	2.35	0.12	2.39	0.46	2.39	0.38
24	2.67	6.30	2.34	0.10	2.40	0.55	2.38	0.38
25	2.66	5.80	2.34	0.10	2.42	0.79	2.39	0.46
26	2.66	5.80	2.34	0.10	2.40	0.55	2.37	0.29
27	2.65	5.40	2.35	0.12	2.42	0.79	2.39	0.46
28	2.65	5.40	2.20	Nil	2.42	0.79	2.38	0.38
29	2.66	5.80	2.24	"	2.40	0.55	2.36	0.21
30	2.49	1.75	2.26	"	2.42	0.79	2.36	0.21
31	2.51	2.10	2.39	0.46	.....	.....	2.36	0.21

e Discharge estimated.

MONTHLY DISCHARGE of Pinepound creek near Spring Coulee (Packard's farm), for 1916

(Drainage area x square miles)

MONTH	DISCHARGE IN SECOND-FEET			RUN-OFF
	Maximum	Minimum	Mean	Total in Acre-feet
March (20-31)	25.00	5.00	13.70	326
April	15.60	1.60	5.40	321
May	8.60	1.45	3.20	197
June	12.40	2.80	6.60	393
July	7.20	0.46	3.80	234
August	3.30	Nil	1.26	77
September	0.79	0.12	0.54	32
October	1.03	0.12	0.51	31
The period	.....	.....	.....	1,611

x The greater portion of the discharge is waste water from the Alberta Railway and Irrigation Company's canal, so drainage area not computed nor applied.

SESSIONAL PAPER No. 25B

ALBERTA RAILWAY AND IRRIGATION COMPANY'S CANAL AT SPRING COULEE

(From St. Mary River at Kimball)

Location.—On the NW. $\frac{1}{4}$ Sec. 28, Tp. 4, Rge. 23, W. 4th Mer.*Records available*.—During irrigation seasons from May 1, 1914, to October 31, 1916.*Gauge*.—Vertical staff; zero of gauge maintained at elevation 87.68 feet since establishment. Gauge read by D. M. Boyd.*Bench-mark*.—Permanent iron bench-mark set 30 feet southwest of rod; assumed elevation 100.00 feet.*Channel*.—Straight for 200 feet above and 100 feet below the cable. The banks are steep and high and the stream bed consists of sand, clay and small stone, liable to shift.*Discharge measurements*.—Made from a temporary cable structure located 150 feet below the gauge.*Remarks*.—Water turned into canal at Kimball, April 25. Gates closed at Kimball, October 7.

DISCHARGE MEASUREMENTS of Alberta Railway and Irrigation Company's canal at Spring Coulee, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 14.....	S. H. Frame.....				1.33	Nil
May 9.....	do.....	47.0	68.4	2.56	3.09	175
May 27.....	do.....	46.0	76.0	2.84	3.25	216
July 17.....	W. A. Burton.....	46.0	76.7	3.16	3.35	242
Aug. 21.....	S. H. Frame.....	46.0	76.0	3.23	3.31	246
Sept. 18.....	W. A. Burton.....	45.0	58.2	2.53	2.89	149
Oct. 9.....	S. H. Frame.....	41.0	25.4	0.82	1.95	21

DAILY GAUGE HEIGHT AND DISCHARGE of Alberta Railway and Irrigation Company's canal at Spring Coulee, for 1916

DAY	April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			3.01	159	3.02	174
2.....			3.02	161	3.02	174
3.....			3.07	171	3.00	170
4.....			3.05	167	2.09	36
5.....			3.07	171	2.10	37
6.....			3.05	167	2.09	36
7.....			3.06	170	2.09	36
8.....			3.05	167	3.00	170
9.....			3.09	175	3.00	170
10.....			3.09	177 _s	3.10	191
11.....			3.10	179	3.16	204
12.....			3.10	180	3.14	200
13.....			3.11	182	3.14	200
14.....			3.12	186	3.06	182
15.....			3.20	203	3.08	187
16.....			3.35	239	3.20	213
17.....			3.37	243	3.26	226
18.....			3.39	248	3.25	224
19.....			3.40	251	3.25	224
20.....			3.42	256	3.05	180
21.....			3.45	263	3.10	191
22.....			3.48	270	3.12	195
23.....			3.70	320	3.30	235
24.....			4.00	386	3.30	235
25.....			3.90	365	3.29	233
26.....			3.27	228 _s	3.30	235
27.....			3.25	224	3.30	235
28.....			3.22	217	3.32	239
29.....	2.70	107	3.24	222	3.32	239
30.....	2.76	116	3.25	224	3.33	242
31.....			3.00	170	.....	.....

s-s Shifting conditions.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Alberta Railway and Irrigation Company's canal at Spring Coulee, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	3.32	239	3.36	248	3.31	237	2.87	145.00
2.....	3.34	244	3.36	248	3.30	235	2.86	143.00
3.....	2.98	166	3.37	250	3.59	299	2.92	154.00
4.....	2.98	166	3.36	248	3.59	299	2.95	160.00
5.....	2.98	166	3.36	248	3.53	286	2.93	156.00
6.....	3.25	224	3.36	248	.....	209 ^e	2.89	148.00
7.....	3.25	224	3.36	248	2.80	132	2.79	130.00
8.....	3.25	224	3.36	248	2.85	141	2.74	122.00
9.....	3.25	224	3.36	248	2.85	141	1.95	21.00
10.....	3.26	226	3.37	250	2.85	141	1.96	22.00
11.....	3.23	220	3.36	248	2.85	141	1.78	6.40
12.....	3.26	226	3.36	248	2.85	141	1.70	Nil
13.....	3.25	224	3.37	250	2.85	141	1.70	"
14.....	3.24	222	3.36	248	2.85	141	1.69	"
15.....	3.24	222	3.37	250	2.85	141	1.70	"
16.....	3.23	220	3.38	253	2.85	141	1.69	"
17.....	3.35	246	3.38	253	2.85	141	1.69	"
18.....	3.36	248	3.37	250	2.89	148	1.71	0.80
19.....	3.36	248	3.36	248	2.89	148	1.71	0.80
20.....	3.36	248	3.30	235	2.89	148	1.72	1.60
21.....	3.35	246	3.31	237	2.88	146	1.72	1.60
22.....	3.34	244	3.30	235	2.87	145	1.73	2.40
23.....	3.35	246	3.31	237	2.87	145	1.73	2.40
24.....	3.35	246	3.31	237	2.89	148	1.72	1.60
25.....	3.36	248	3.31	237	3.01	172	1.72	1.60
26.....	3.35	246	3.30	235	3.04	178	1.71	0.80
27.....	3.36	248	3.31	237	3.05	180	1.69	Nil
28.....	3.35	246	3.30	235	3.05	180	1.67	"
29.....	3.35	246	3.31	237	3.04	178	1.63	"
30.....	3.36	248	3.31	237	3.04	178	1.52	"
31.....	3.36	248	3.31	237	.....	.....	1.48	"

^e Discharge estimated.

MONTHLY DISCHARGE of Alberta Railway and Irrigation Company's canal at Spring Coulee, for 1916

MONTH	DISCHARGE IN SECOND-FEET			RUN-OFF
	Maximum	Minimum	Mean	
				Total Discharge in Acre-ft.
April (29-30).....	116	107	112	444
May.....	386	159	217	13,343
June.....	242	36	184	10,949
July.....	248	166	230	14,142
August.....	253	235	244	15,003
September.....	299	132	173	10,294
October.....	160	Nil	39	2,598
The period.....				66,573

POTHOLE CREEK NEAR MAGRATH (UPPER STATION)

Location.—On the NW. $\frac{1}{4}$ Sec. 10, Tp. 5, Rge. 22, W. 4th Mer., three and one-half miles south and one mile west of Magrath.

Records available.—April 27, 1914, to October 31, 1916.

Gauge.—Vertical staff. Zero of gauge maintained at elevation of 92.68 feet since establishment. Gauge read by L. A. Harrison.

Bench-mark.—Permanent iron bench-mark, located on the right bank thirty feet south of the staff gauge; assumed elevation 100.00 feet.

Channel.—Straight for about 100 feet above and 50 feet below gauge, composed of fine gravel and stones and liable to shift during floods.

Discharge measurements.—Made with current-meter by wading at low stages; by cable at high stages.

Winter flow.—Station discontinued during winter season.

Remarks.—A one-half inch steel cable was installed at this station in 1916.

DISCHARGE MEASUREMENTS of Pothole (Upper Station) creek near Magrath, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 20.....	S. H. Frame.....	30.5	22.0	2.51	1.94	56.0
April 13.....	do.....	19.0	10.6	1.79	1.32	18.5
May 10.....	do.....	17.0	5.8	0.60	0.98	3.5
May 27.....	W. A. Burton.....	30.0	87.0	4.00	3.62	348.0e
June 8.....	S. H. Frame.....	24.0	19.2	2.53	1.65	48.0
July 18.....	W. A. Burton.....	22.5	11.3	1.81	1.41	20.0
Aug. 11.....	S. H. Frame.....	31.0	26.0	2.85	1.81	74.0
Aug. 30.....	W. A. Burton.....	8.0	3.1	2.13	1.08	6.6
Sept. 18.....	S. H. Frame.....	11.0	5.7	2.35	1.19	13.4
Oct. 13.....	do.....	27.0	31.6	0.93	1.36	29.0

e Discharge estimated by field inspection.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE OF Pothole (Upper Station) creek near Magrath, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1			1.86	73.0	1.32	18.3	1.16	9.5	2.61	189.0
2			1.98	91.0	1.34	19.6	1.18	10.4	2.41	158.0
3			2.05	102.0	1.33	18.9	1.19	10.9	2.21	127.0
4			2.10	110.0	1.32	18.3	1.19	10.9	2.31	142.0
5			2.05	102.0	1.33	18.9	1.10	7.0	3.71	361.0
6			1.90	79.0	1.36	21.0	1.03	4.7	3.31	298.0
7			1.85	71.0	1.38	22.0	1.02	4.4	2.31	142.0
8			3.00	344.0	1.42	25.0	1.02	4.4	1.65	46.0
9			4.51	486.0	1.36	21.0	1.01	4.2	1.61	42.0
10			5.41	626.0	1.22	12.5	0.98	3.5	1.81	66.0
11			5.01	564.0	1.19	10.9	1.00	3.9	2.01	96.0
12			4.81	532.0	1.17	10.0	1.00	3.9	1.76	60.0
13			3.42	316.0	1.32	18.3	1.06	5.6	1.71	53.0
14			3.02	253.0	1.12	7.8	1.09	6.6	1.64	45.0
15			2.42	160.0	1.09	6.6	1.07	5.9	1.51	33.0
16			2.22	128.0	1.09	6.6	1.06	5.6	1.41	24.0
17			2.12	113.0	1.08	6.3	1.03	4.7	1.36	21.0
18			2.02	97.0	1.05	5.2	1.01	4.2	1.31	17.6
19			1.72	55.0	1.02	4.4	1.01	4.2	1.61	42.0
20			1.94	85.0	1.00	3.9	1.00	3.9	1.69	51.0
21			1.75	58.0	1.00	3.9	1.00	3.9	1.73	56.0
22	2.80	219	1.62	43.0	0.98	3.5	1.12	7.8	1.87	74.0
23	2.70	203	1.47	29.0	0.98	3.5	1.25	14.1	1.91	80.0
24	2.70	203	1.37	22.0	0.97	3.3	2.99	248.0	1.90	79.0
25	2.65	195	1.32	18.3	0.97	3.3	4.99	560.0	1.87	74.0
26	2.63	192	1.31	17.6	0.98	3.5	4.51	486.0	1.83	69.0
27	2.25	133	1.31	17.6	0.98	3.5	3.91	392.0	1.82	67.0
28	1.90	79	1.33	18.9	0.99	3.7	3.71	361.0	3.12	269.0
29	1.82	67	1.34	19.6	1.07	5.9	3.51	330.0	3.03	255.0
30			1.32	18.3	1.14	8.6	3.21	283.0	2.68	200.0
31			1.33	18.9			3.01	252.0		

DAILY GAUGE HEIGHT AND DISCHARGE of Pothole (Upper Station) creek near Magrath, for 1916
—Concluded

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	2.12	113.0	0.93	2.50	1.07	5.9	1.10	7.0
2	2.10	110.0	0.93	2.50	1.30	17.0	1.20	11.4
3	1.99	92.0	0.90	2.00	3.40	312.0	1.20	11.4
4	1.86	73.0	0.89	1.86	4.00	406.0	1.25	14.1
5	1.75	58.0	0.86	1.44	4.15	429.0	1.35	20.0
6	1.62	43.0	0.86	1.44	4.00	406.0	1.35	20.0
7	1.82	67.0	0.85	1.30	3.20	281.0	1.30	17.0
8	1.70	52.0	0.83	1.10	3.00	250.0	1.25	14.1
9	1.61	42.0	2.02	97.00	2.50	172.0	1.36	21.0
10	1.52	34.0	4.03	411.00	2.10	110.0	1.34	19.6
11	1.49	31.0	2.46	166.00	1.75	58.0	1.32	18.3
12	1.42	25.0	2.16	119.00	1.40	24.0	1.30	17.0
13	1.36	21.0	1.63	44.00	2.00	94.0	1.36	21.0
14	1.32	18.3	1.56	37.00	1.80	65.0	1.27	15.3
15	1.29	16.4	1.44	27.00	1.60	41.0	1.26	14.7
16	1.26	14.7	1.33	18.90	1.40	24.0	1.25	14.1
17	1.17	10.0	1.38	22.00	1.30	17.0	1.25	14.1
18	1.41	24.0	1.39	23.00	1.19	10.9	1.26	14.7
19	1.23	13.0	1.41	24.00	1.25	14.1	1.24	13.6
20	1.21	11.9	1.39	23.00	1.20	11.4	1.24	13.6
21	1.19	10.9	1.38	22.00	1.15	9.0	1.25	14.1
22	1.19	10.9	1.37	22.00	1.15	9.0	1.27	15.3
23	1.17	10.0	1.36	21.00	1.12	7.8	1.27	15.3
24	1.15	9.0	1.35	20.00	1.12	7.8	1.26	14.7
25	1.19	10.9	1.34	19.60	1.10	7.0	1.26	14.7
26	1.15	9.0	1.29	16.40	1.10	7.0	1.25	14.1
27	1.11	7.4	1.18	10.40	1.10	7.0	1.26	14.7
28	1.05	5.2	1.14	8.60	1.10	7.0	1.27	15.3
29	1.03	4.7	1.14	8.60	1.10	7.0	1.28	15.8
30	0.99	3.7	1.08	6.30	1.10	7.0	1.29	16.4
31	0.97	3.3	1.10	7.00	.....	.....	1.30	17.0

MONTHLY DISCHARGE of Pothole (Upper Station) creek near Magrath, for 1916

(Drainage area 162 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (22-29)	219	67.00	161.0	0.994	0.30	2,554
March	626	17.60	151.0	0.932	1.07	9,285
April	25	3.30	10.6	0.065	0.07	631
May	560	3.50	99.0	0.611	0.70	6,087
June	361	17.60	108.0	0.667	0.74	6,426
July	113	3.30	31.0	0.191	0.22	1,906
August	411	1.10	38.0	0.235	0.27	2,337
September	429	5.90	94.0	0.580	0.65	5,593
October	21	7.00	15.5	0.096	0.11	953
The period					4.13	35,772

SESSIONAL PAPER No. 25b

POTHOLE CREEK NEAR MAGRATH (LOWER STATION)

Location.—On the NE. $\frac{1}{4}$ Sec. 1, Tp. 6, Rge. 22, W. 4th Mer., three miles northeast of Magrath.

Records available.—April 28, 1914, to October 31, 1916.

Gauges.—Vertical staff; from April 28, 1914, to June 7, 1916. Open chain gauge from June 7, 1916, to date. On July 13, 1914, the gauge was moved 336 feet down stream from original location. From April 28, 1914, to July 13, 1914, zero of gauge was maintained at 92.87 feet and from July 13, 1914, to date, it has been maintained at 93.42 feet.

Bench-mark.—Permanent iron bench-mark located on the left bank, 50 feet from the staff; assumed elevation 100.00 feet.

Channel.—Composed of sand, gravel and clay, liable to shift during floods.

Discharge measurements.—Made with current-meter, by wading at low stages and from cable at high stages.

Floods.—Caused by overflow from Alberta Railway and Irrigation Company's canal.

Winter flow.—Station is not maintained during winter season.

Observers.—From February 28 to March 31, R. Hyden. From April 1 to May 30, F. Howes. From June 1 to June 30, R. Hyden. From July 1 to October 31, John Brown.

DISCHARGE MEASUREMENTS of Pothole (Lower Station) creek near Magrath, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 20.....	S. H. Frame.....	48.0	36.7	2.26	2.23	83.0
April 13.....	do.....	33.0	15.7	1.38	1.72	22.0
May 10.....	do.....	49.0	34.4	2.20	2.25	76.0
May 27.....	W. A. Burton.....	50.0	140.0	4.29	4.00	600.0 ^e
June 7.....	S. H. Frame.....	57.0	61.4	2.38	2.73	145.0
July 18.....	W. A. Burton.....	58.0	65.7	2.17	2.74	143.0
Aug. 11.....	S. H. Frame.....	70.0	96.6	2.84	3.08	275.0
Aug. 30.....	W. A. Burton.....	61.0	53.4	2.17	2.56	116.0
Sept. 18.....	S. H. Frame.....	51.0	35.2	1.83	2.16	64.0
Oct. 13.....	do.....	45.0	28.2	1.51	1.90	43.0

^e Discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE OF Pothole (Lower Station) creek near Magrath, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.			1.86	3.0e	1.90	37.0		70.0e	3.35	278
2.				3.0e	1.90	37.0	2.18	66.0	3.35	278
3.			1.86	2.0	1.90	37.0	2.20	68.0		230e
4.			1.86	2.0		37.0e	2.25	74.0		190
5.				2.0e	1.90	37.0		74.0e	2.60	154
6.			1.36	3.0	1.85	32.0	2.25	74.0	3.60	353
7.			1.36	3.0		32.0e		72.0e	2.73	142
8.				10.0e	1.85	32.0	2.23	71.0		105e
9.			1.86	30.0		30.0e	2.23	71.0	2.20	68
10.			b	80.0e	1.80	28.0	2.25	74.0		80e
11.			3.76	408.0	1.80	28.0	2.25	74.0	2.40	93
12.				408.0e		25.0e		75.0e	2.67	132
13.			3.76	408.0	1.72	22.0	2.27	76.0	2.55	113
14.			2.11	58.0		18.0e	2.25	74.0		100e
15.				50.0e	1.60	14.0	2.20	68.0	2.36	88
16.			1.96	43.0		14.0e		55.0e		88e
17.				38.0e	1.60	14.0	1.95	42.0	2.36	88
18.			1.86	33.0		14.0e	2.07	54.0		62e
19.				52.0e	1.60	14.0		48.0e	1.90	37
20.			2.23	71.0	1.60	14.0	1.95	42.0		52e
21.				69.0e	1.50	8.0	1.70	21.0	2.20	68
22.			2.20	68.0	1.50	8.0	2.10	57.0	2.40	93
23.			2.20	68.0		8.0e	2.45	99.0	2.35	86
24.				57.0e	1.50	8.0		270.0e		88e
25.			2.00	46.0	1.50	8.0	3.85	441.0		90e
26.				44.0e	1.45	5.6	4.80	900.0	2.40	93
27.			1.95	42.0	1.50	8.0	4.00	503.0	2.72	140
28.	2.11b	1.0e	1.90	37.0		28.0e		324.0e	5.60	1,300
29.		2.0e		42.0e		60.0e	2.75	145.0	3.55	337
30.			2.00	46.0	2.35	86.0		146.0e		330e
31.			1.90	37.0			2.76	147.0		

b-b Ice conditions from Feb. 28 to Mar. 10.

e Discharge estimated.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Pothole (Lower Station) creek near Magrath, for 1916
—Concluded

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1		284 _e	2.58	148	2.50	106	1.97	44.0
2		238 _e	2.61	155	3.63	363	1.99	46.0
3	3.00	193	2.62	158	3.70	387	2.86	165.0
4	3.17	232	2.68	171	4.00	503	2.87	167.0
5	3.06	206	2.52	144	3.60	353	2.76	147.0
6	2.97	187	2.48	138	3.50	321	2.75	145.0
7	2.98	189	2.49	140	2.98	189	2.67	132.0
8	3.01	196	2.33	116	2.60	121	2.66	130.0
9	2.96	185	4.20	720	2.70	137	2.21	73.0
10	3.02	198	3.33	346	3.66	373	2.04	51.0
11	2.99	191	3.08	375	3.70	387	1.94	41.0
12	2.90	173	3.09	278	3.80	422	1.92	39.0
13	2.87	167	2.80	204	3.75	404	1.90	37.0
14	2.72	140	2.80	203	3.60	353	1.80	28.0
15	2.63	125	2.68	177	2.70	137	1.89	36.0
16	2.98	189	2.51	144	2.65	128	1.81	29.0
17	2.56	115	2.63	164	2.70	137	1.97	44.0
18	2.74	143	2.98	238	2.16	64	1.84	32.0
19	2.84	164 _s	2.80	195	2.73	142	1.80	28.0
20	2.54	116	2.70	172	2.31	81	1.82	30.0
21	2.62	132	2.70	170	2.13	60	1.79	27.0
22	2.30	88	2.73	172	2.11	58	1.93	40.0
23	2.40	103	2.65	155	2.00	46	1.95	42.0
24	2.42	108	2.70	162	2.06	53	1.92	39.0
25	2.46	116	2.60	141	2.13	60	1.89	36.0
26	2.51	126	2.70	155	2.14	61	1.78	27.0
27	2.76	172	2.60	134	2.10	57	1.94	41.0
28	2.71	164	2.63	134	2.07	54	1.73	23.0
29	2.60	146	2.60	126	2.16	64	1.64	16.6
30	2.63	153	2.56	116 _s	2.05	52	1.79	27.0
31	2.61	152	2.53	111			1.56	11.4

s-s Shifting conditions.

MONTHLY DISCHARGE of Pothole (Lower Station) creek near Magrath, for 1916

MONTH	DISCHARGE IN SECOND-FEET			RUN-OFF Total in Acre-feet
	Maximum	Minimum	Mean	
February (28-29)	2	1.0	1.5	6
March	408	2.0	73.0	4,489
April	86	5.6	25.0	1,488
May	900	21.0	141.0	8,670
June	1,300	37.0	179.0	10,651
July	284	88.0	164.0	10,084
August	720	111.0	192.0	11,806
September	503	46.0	189.0	11,246
October	167	11.4	57.0	3,505
The period				61,945

z Owing to the greater part of the discharge being waste water from the Alberta Railway and Irrigation Company's canal, the drainage area has not been taken out.

ST. MARY RIVER AT WHITNEY'S RANCH

Location.—On the NE. $\frac{1}{4}$ Sec. 26, Tp. 7, Rge. 22, W. 4th Mer.

Records available.—October 13, 1911, to December 31, 1915.

Gauge.—Vertical staff. Zero of gauge maintained at 87.55 feet during 1911. Zero of gauge maintained at 89.13 feet during 1912. Zero of gauge maintained at 89.15 feet during 1913-16.

A Stevens Type B, Continuous Water Stage Recorder with same datum as the staff gauge was used from June 8, to November 14, 1916.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet, located near Mr. Whitney's house.

Channel.—Consists of gravel and is liable to shift.

Discharge measurements.—Made from a cable car, located about 2,000 feet down stream from the gauge.

Winter flow.—Obtained through the ice, 240 feet down stream from the cable.

Observer.—W. D. Whitney.

DISCHARGE MEASUREMENTS of St. Mary river at Whitney's ranch, in 1916.

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 5	W. H. Storey	120	226	0.65	1.84b	148
Feb. 2	V. A. Newhall	105	144	1.06	1.96b	153
Feb. 21	H. W. Rowley	265	515	4.02	2.22	2,072
Mar. 10	do	240	614	2.70	2.16	1,659
Mar. 27	J. M. Paul	203	310	2.79	1.45	866
April 28	do	202	304	2.91	1.44	886
May 17	W. M. Edwards	245	434	3.40	1.85	1,561
June 15	do	300	818	4.73	2.77	3,865
June 22	J. E. Degnan	381	1,420	6.28	3.97	8,887
June 24	do	378	1,323	5.96	3.66	7,889
June 27	do	375	1,208	5.54	3.38	6,687
July 17	W. M. Edwards	318	799	4.22	2.60	3,370
Aug. 14	do	261	443	3.11	1.84	1,377
Sept. 11	do	221	416	3.17	1.80	1,319
Oct. 6	J. R. Estey	195	239	2.40	1.27	571
Oct. 21	E. J. Switzer	132	187	2.55	1.17	478
Nov. 14	W. M. Edwards	184	131	1.74	1.29b	227
Dec. 7	H. W. Rowley	80	98	1.66	1.06b	163
Dec. 28	do	127	207	0.87	1.54b	179

b Ice conditions.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of St. Mary river at Whitney's ranch, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	1.60b	135	1.62	152	1.05	210	1.50	912	1.50	912	2.50	3,008
2....	1.70	130	1.96	153	1.05	210	1.53	955	1.55	984	2.50	3,008
3....	1.75	132	1.96	154	1.07	210	1.55	984	1.65	1,131	2.55	3,159
4....	1.85	140	2.02	158	1.03	180	1.55	984	1.75	1,296	2.55	3,159
5....	1.85	148	2.02	160	1.50	680	1.53	955	1.85	1,476	2.57	3,219
6....	1.88	154	2.02	162	1.35	480	1.50	912	1.90	1,568	2.60	3,310
7....	1.88	157	2.07	165	1.50	660	1.50	912	2.00	1,770	2.60	3,310
8....	1.90	160	2.12	169	1.60	780	1.47	872	2.10	1,990	2.54x	3,129
9....	1.90	160	2.17	174	1.70	900	1.47	872	2.20	2,215	2.54	3,129
10....	1.90	160	2.22	179	2.73	1,660	1.45	845	2.30	2,460	2.61	3,344
11....	1.90	160	2.27	183	2.73	1,700	1.43	818	2.25	2,338	2.83	4,116
12....	1.91	160	2.27	190	2.57	1,600	1.43	818	2.25	2,338	2.89	4,346
13....	1.91	160	2.37	200	2.47	1,600	1.43	818	2.22	2,264	2.81	4,038
14....	1.91	160	4.02bg	800s	2.22	1,200	1.42	805	1.95	1,669	2.78	3,930
15....	1.90	158	4.17	1,200s	1.72	900	1.42	805	1.87	1,513	2.78	3,930
16....	1.90	157	4.02	1,200s	1.67	800	1.42	805	1.87	1,513	2.88	4,308
17....	1.85	157	.....g	2,000e	1.65	800	1.42	805	1.83	1,440	3.04	4,956
18....	1.83	156	.....	1,800e	1.62	750	1.42	805	1.85	1,476	3.24	5,818
19....	1.80	155	.....	2,000e	1.62	750	1.43	818	1.90	1,568	3.46	6,816
20....	1.75	154	.....	2,000e	1.57	700	1.43	818	1.90	1,568	3.67	7,808
21....	1.68	154	2.22	2,072d	1.57	700	1.45	845	1.95	1,669	3.80	8,433
22....	1.65	154	2.10	1,600s	1.57	700	1.45	845	1.95	1,669	3.91	8,964
23....	1.63	154	1.85	1,200	1.57	700	1.47	872	2.00	1,770	.....	8,362e
24....	1.60	154	1.80	1,020	1.52	650	1.47	872	2.10	1,990	3.66	7,760
25....	1.57	153	1.52	780	1.52	650	1.46	858	2.30	2,460	3.43	6,678
26....	1.57	152	1.50	760	1.82	900s	1.46	858	2.60	3,310	3.27	5,952
27....	1.55	152	1.82	900	1.45	845	1.46	858	2.45	2,864	3.27	5,952
28....	1.52	151	1.05	220	1.45	845	1.44	832	2.45	2,864	3.36	6,358
29....	1.47	151	1.03	200	1.47	872	1.45	845	2.45	2,864	3.70	7,950
30....	1.47	151	.....	.....	1.47	872	1.45	845	2.45	2,864	3.71	7,998
31....	1.47	151	.....	.....	1.50	912	.....	.....	2.47	2,922	.....	.....

b-b Ice conditions.

g Ice going out, February 14 to February 17.

x Automatic gauge heights from June 8 to November 7.

d Actual measurement.

s Shifting conditions, February 22 to March 26.

e Discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of St. Mary river at Whitney's ranch,
for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	3.60	7,475	2.00	1,770	1.57	1,012	1.25	588	1.09	408	1.35	195
2....	3.41	6,586	2.01	1,792	1.56	998	1.23	564	1.09	408	1.33	190
3....	3.40	6,540	2.02	1,814	1.60	1,055	1.23	564	1.08	397	1.34	185
4....	3.41	6,586	2.05	1,880	1.80	1,385	1.25	588	1.10	418	1.34	180
5....	3.36	6,358	2.06	1,902	1.76	1,314	1.25	588	1.12	440	1.25	175
6....	3.30	6,085	2.08	1,946	1.75	1,296	1.27	612	1.13	451	1.20	169
7....	3.20	5,640	2.12	2,035	1.77	1,332	1.30	648	1.11 ^x	429	1.06	163
8....	3.10	5,205	2.15	2,102	1.78	1,350	1.32	674	1.00	315	1.15	161
9....	3.04	4,956	1.88	1,531	1.79	1,367	1.29	636	1.00	315	1.12	160
10....	3.00	4,798	1.70	1,208	1.80	1,385	1.26	600	0.99	305	1.12	159
11....	2.98	4,709	1.74	1,279	1.80	1,385	1.24	576	0.99	305	1.10	158
12....	2.96	4,628	1.80	1,385	1.75	1,296	1.24	576	.....	415 ^e	1.10	158
13....	2.93	4,506	1.80	1,385	1.71	1,226	1.22	552	.....	525 ^e	1.09	157
14....	2.90	4,385	1.84	1,458	1.66	1,147	1.20	528	1.29	636	1.09	156
15....	2.89	4,346	1.81	1,403	1.62	1,086	1.19	517	1.35	713	1.07	156
16....	2.76	3,860	1.76	1,314	1.59	1,041	1.16	484	1.40	778	1.06	155
17....	2.63	3,412	1.74	1,279	1.57	1,012	1.16	484	1.40	778	1.06	154
18....	2.65	3,480	1.75	1,296	1.54	969	1.17	495	1.40	778	1.06	155
19....	2.60	3,310	1.75	1,296	1.51	926	1.17	495	1.50	912	1.05	156
20....	2.53	3,099	1.76	1,314	1.47	872	1.15	473	1.55	984	1.05	156
21....	2.46	2,893	1.75	1,296	1.45	845	1.17	495	1.60 ^b	215	1.04	157
22....	2.38	2,668	1.72	1,243	1.43	818	1.21	540	1.53	215	1.04	159
23....	2.33	2,538	1.69	1,193	1.40	778	1.28	624	1.50	214	1.04	160
24....	2.29	2,436	1.65	1,131	1.38	752	1.25	588	1.47	212	1.62	165
25....	2.23	2,288	1.61	1,070	1.36	726	1.24	576	1.46	210	1.60	168
26....	2.18	2,170	1.59	1,041	1.33	687	1.19	517	1.45	208	1.59	171
27....	2.15	2,102	1.58	1,026	1.32	674	1.16	484	1.45	207	1.57	175
28....	2.14	2,080	1.58	1,026	1.32	674	1.16	484	1.43	204	1.58	179
29....	2.11	2,012	1.58	1,026	1.30	648	1.16	484	1.40	202	1.58	187
30....	2.07	1,924	1.58	1,026	1.28	624	1.14	462	1.38	199	1.58	190
31....	2.03	1,836	1.58	1,026	.....	.....	1.11	429	.....	.....	1.58 ^b	193

^x Automatic gauge records from June 8 to November 7.
^{b-b} Ice conditions.

MONTHLY DISCHARGE of St. Mary river at Whitney's ranch, for 1916

(Drainage area 1,394 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	160	130	153	0.110	0.13	9,408
February.....	2,000	152	757	0.543	0.59	43,543
March.....	1,700	180	820	0.588	0.68	50,420
April.....	984	805	862	0.618	0.69	51,293
May.....	3,310	912	1,959	1.400	1.61	120,425
June.....	8,964	3,008	5,208	3.740	4.17	309,824
July.....	7,475	1,836	4,029	2.890	3.33	247,074
August.....	2,102	1,026	1,403	1.010	1.16	86,246
September.....	1,385	624	1,023	0.734	0.82	60,858
October.....	674	429	546	0.392	0.45	33,572
November.....	984	199	427	0.306	0.34	25,408
December.....	195	154	168	0.121	0.14	10,330
The year.....	.....	.....	.....	.....	14.11	1,049,001

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE of St. Mary river at Whitney's ranch

(Area of watershed 1,394 square miles)

(Average run-off per square mile 526.7 acre-feet)

YEAR	Jan. Sec.-ft.	Feb. Sec.-ft.	Mar. Sec.-ft.	April Sec.-ft.	May Sec.-ft.	June Sec.-ft.	July Sec.-ft.	Aug. Sec.-ft.	Sept. Sec.-ft.	Oct. Sec.-ft.	Nov. Sec.-ft.	Dec. Sec.-ft.	Total Acre-ft.
1911.....										535b	730	215	76,820a
1912.....	263	212	134b	949b	1,977	2,074	1,723	867	433	479	523	271	593,327
1913.....	88	108	201	1,224	2,002	4,163	1,859	942	339	532	538	197	736,631
1914.....	191	129	336	799	1,851	1,790	992	386	318	1,067	889	203	542,074
1915.....	180	186	897	705	1,744	2,744	1,959	1,054	909	934	739	326	749,550
1916.....	153	757	820	862	1,959	5,208	4,029	1,403	1,023	546	427	168	1,049,001
Average Sec.-ft.	175	278	478	908	1,906	3,196	2,112	930	604	682	641	230	734,116
Average Acre-ft.	10,760	15,439	29,391	54,030	117,195	190,175	129,862	57,185	35,940	41,935	38,142	14,142	734,196

a Not included in average.

b Reduced to monthly average.

MILK RIVER DRAINAGE BASIN

General Description

Milk river rises on the eastern slope of the foot-hills on the Blackfoot Indian Reserve in the United States. Its headwaters run down in two main streams, which are known, after entering Canada, as the north and south branches.

The north branch flows in a northeasterly direction through the Blackfoot Reserve for a distance of about fifteen miles, and then enters Canada near the quarter mound on the south side of Section 3, Township 1, Range 23, West of the 4th Meridian. From the international boundary the stream continues in a northeasterly direction for about nine miles, when it bends to the east and runs in an easterly direction through the second tier of townships to its junction with the south branch at the centre of Section 20, Township 2, Range 18, West of the 4th Meridian.

The south branch runs to the south and east of, and parallels the north branch for a distance of about forty-eight miles, as the crow flies, through the Blackfoot Reserve, and then enters Canada near the quarter mound on the south side of Section 1, Township 1, Range 20, West of the 4th Meridian. From the international boundary it flows in a northeasterly direction to its junction with the north branch.

From the confluence of the two branches, Milk river flows in an easterly direction through the second tier of townships in Canada to the east boundary of Range 7. From this point the river flows in a southeasterly direction to its first point of crossing the international boundary into the United States. This first point of crossing is near the quarter mound on the south side of Section 3, Township 1, Range 5, West of the 4th Meridian. From this point the river meanders in an easterly direction through Canada and the United States, to a point on the international boundary, about 900 feet west of the east boundary of Section 1, Township 1, Range 5, West of the 4th Meridian, where it finally crosses into the United States. This point is known as the "Eastern Crossing." The length of the course of the Milk river in Canada from the western crossing of the north branch to the eastern crossing is 179 miles. The length of the course of the south branch in Canada is 14 miles.

Throughout its course in Canada, from the western crossing of the north branch to the eastern crossing, Milk river flows through a well-defined valley, bordered on the east side by a range of hills. The whole of its watershed in Canada is treeless prairie land, the last 40 miles of river flat being, however, well wooded. The river receives a number of small tributary creeks along its course, all of which discharge a considerable volume of water during the spring freshets; usually they all dry up about July 1, and have no discharge again until late in the fall, when some of them have a small flow for perhaps a month before the freeze-up.

The general conditions of flow in the river are such as are typical of all rivers which have a watershed devoid of tree growth; that is, it is subject to extreme floods during the freshet period, and to correspondingly low flow during the summer months. From its headwaters to the "Eastern Crossing" the total area of the watershed of Milk river is 2,514 square miles. Of this total amount 1,627 miles are in Canada and 887 square miles in the United States.

NORTH BRANCH OF MILK RIVER AT PETERS' RANCH

Location.—On the NE. $\frac{1}{4}$ Sec. 11, Tp. 1, Rge. 23, W. 4th Mer.

Records available.—July 21, 1909, to December 31, 1916.

Gauges.—Friez automatic water-stage register used during open water. Vertical staff and open chain gauge installed September, 1916, used during ice conditions. Zero of gauges maintained at elevation 4,089.57 feet during 1913-16. Previous elevation of 4,110.45 in error. Gauge read by William Wheeler.

Bench-mark.—Permanent iron bench-mark; elevation 4,095.99 above mean sea-level (Irrigation surveys, 1915 datum). Previous elevation 4,116.87 in error.

Channel.—Bed not liable to shift. Clay banks likely to wash and change section and control.

Discharge measurements.—At low stages, from foot-bridge 700 feet below gauge, and at flood periods from cable car, two miles below.

Winter flow.—Obtained through the ice at foot-bridge.

Accuracy.—Stage-discharge relation permanent except during period of high water and ice; this condition necessitated frequent gaugings. By means of these measurements a rating curve fairly well defined, was drawn to represent average conditions. The operation of the Friez water stage register in use from April 6 to November 10, was satisfactory, except short period indicated by break in records, as shown in footnote to daily discharge table. Under ice conditions gauge read daily to one one-hundredth of a foot. Daily discharge ascertained by applying mean daily gauge height to rating table from April 26 to May 24, and from June 27 to August 19. Bolster method used from March 14 to April 25, May 25 to June 27, August 20 to November 10. Daily discharge during ice conditions ascertained from hydrograph derived from mean daily gauge height, discharge measurements and temperatures.

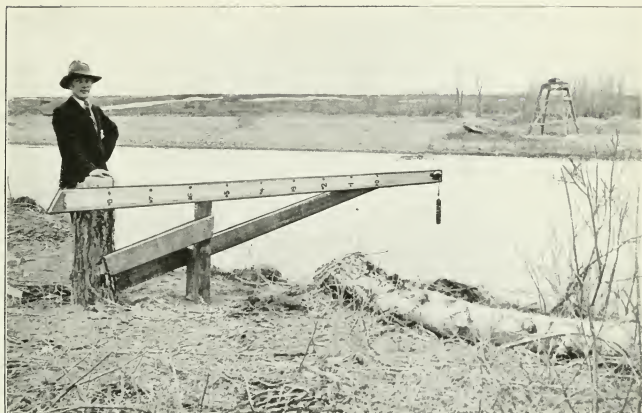
Remarks.—Amount of water reaching North Branch of Milk river from United States Reclamation Service's St. Mary canal during 1916 was 1,528 acre-feet.

DISCHARGE MEASUREMENTS of North branch of Milk river at Peters' ranch, in 1916

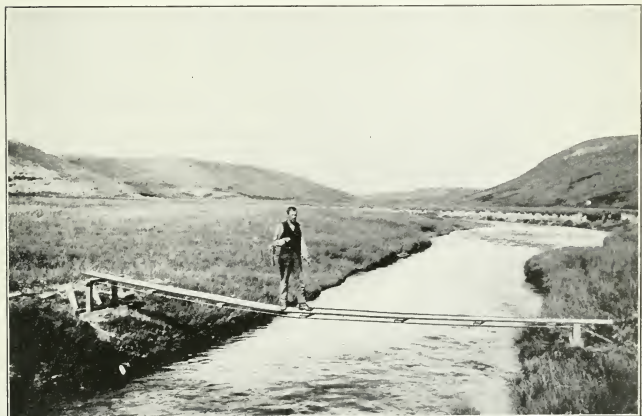
Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 11.	W. H. Storey	21.5	27.4	1.18	3.09b	32.0
Feb. 11.	V. A. Newhall	16.0	17.4	0.32	3.57	5.5e
Mar. 2	do	42.0	69.2	0.52	3.11b	36.0
Mar. 16.	S. H. Frame	46.0	49.9	1.82	2.45	91.0
April 6	do	45.5	39.2	1.90	2.30	74.0
April 25.	do	43.0	33.6	1.73	2.07	58.0
April 26.	W. A. Lamb (U.S.G.S.)	35.0	38.0	1.45	2.10	55.0
May 24.	do	42.0	50.0	2.12	2.45	106.0
May 31.	S. H. Frame	46.0	49.1	2.02	2.45	99.0
June 1.	do	22.5	61.2	2.94	2.84	180.0
June 11.	A. H. Tuttle (U.S.G.S.)	22.0	58.0	3.14	2.90	182.0
June 21.	S. H. Frame	21.0	51.9	2.00	2.44	103.0
June 27.	do	21.0	52.9	2.27	2.47	120.0
June 27.	A. H. Tuttle (U.S.G.S.)	22.0	45.0	2.24	2.50	104.0
June 28.	S. H. Frame	22.0	75.9	3.34	3.32	267.0
July 19.	W. A. Lamb (U.S.G.S.)	43.0	40.8	1.75	2.23	72.0
July 23.	W. A. Burton	22.0	45.4	1.38	2.13	62.0
Aug. 19.	V. A. Newhall	22.0	47.7	1.94	2.38	92.0
Sept. 5.	S. H. Frame	22.0	50.0	2.02	2.38	101.0
Sept. 6.	do	22.0	46.3	1.72	2.28	80.0
Sept. 7.	do	22.0	45.8	1.59	2.21	73.0
Sept. 7.	do	25.5	51.9	1.34	2.27	71.0
Sept. 27.	do	22.0	40.8	1.44	2.19	59.0
Sept. 28.	do	22.0	39.2	1.31	2.14	52.0
Nov. 15.	do	22.0	38.1	1.38	2.49b	53.0
Nov. 16.	do	22.0	38.1	1.43	2.41	55.0
Dec. 12.	H. W. Rowley	22.0	34.6	1.17	2.36b	41.0

b Ice conditions from Jan. 1 to Mar. 13; Nov. 11 to Dec. 31.

e Discharge estimated, by field inspection.



Open chain gauge used on Waterton river, near Stand Off.
Taken on April 4, 1916, by S. H. Frame.



Bridge used for making gaugings of the North Branch of the Milk river at Peters' ranch.
Taken on September 28, 1916, by S. H. Frame.

SESSIONAL PAPER No. 25a

DAILY GAUGE HEIGHT AND DISCHARGE of North branch of Milk river, at Peters' ranch, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	3.20 _{bz}	34.0	3.77	18.3	3.54	93	2.36	81	2.25	74	2.72	158
2....	3.28	34.0	3.65	16.6	3.11	36	2.35	80	2.35	88	2.66	145
3....	3.19	34.0	3.58	15.0	2.85	37	2.37	83	2.25	74	2.40	96
4....	3.14	33.0	3.64	13.6	2.74	40	2.22	63	2.17	63	2.33	84
5....	2.99	33.0	3.56	12.0	2.79	43	2.16 _x	57	2.16	62	2.69	149
6....	2.87	33.0	.....	10.4 _e	2.73	46	2.30	74	2.11	56	2.75	159
7....	2.61	33.0	3.86	9.0	2.75	51	2.34	80	2.10	55	2.45	102
8....	3.03	33.0	3.74	8.0	2.94	64	2.34	81	2.08	53	2.38	88
9....	3.08	32.0	3.91	7.0	4.30	83	2.39	90	2.06	51	2.36	84
10....	.....	32.0 _e	.....	6.1 _e	5.11	104	2.42	96	2.02	47	2.71	148
11....	3.09	32.0	3.57	5.5	4.64	123	2.38	90	2.02	47	2.83	169
12....	3.18	32.0	3.45	53.0	3.34	144	2.43	100	2.08	53	2.46	101
13....	3.22	32.0	3.86	110.0	....._b	164 _e	2.44	103	2.10	55	2.36	84
14....	3.23	32.0	4.43	160.0	2.98	189	2.37	91	2.11	56	2.34	82
15....	3.26	31.0	5.27	165.0	2.79	154	2.25	73	2.05	50	2.29	75
16....	.....	31.0 _e	.....	169.0 _e	2.45	91	2.33	86	2.15	61	2.27	73
17....	3.26	31.0	7.35	171.0	2.39	82	2.32	85	2.06 _x	51	2.25	71
18....	3.24	31.0	7.26	174.0	2.20	58	2.29	82	2.05	50	2.22	68
19....	3.32	30.0	6.52	178.0	2.37	80	2.28	81	2.04	49	2.31	80
20....	3.21	31.0	4.25	180.0	2.50	102	2.22	73	2.05	50	2.36	88
21....	2.93	32.0	3.95	178.0	2.49	100	2.16	66	2.03	48	2.42	100
22....	3.10	34.0	3.75	176.0	2.34	76	2.17	68	2.00	45	2.48	110
23....	3.25	35.0	3.55	173.0	2.23	62	2.14	65	2.22	70	2.56	125
24....	.....	34.0 _e	3.54	169.0	2.15	54	2.10	61	2.45	106	2.30	80
25....	3.66	32.0	3.02	165.0	2.14	53	2.07	58	.....	166 _e	2.37	90
26....	3.72	30.0	2.55	160.0	2.21	61	2.11	56	3.10	225	2.39	94
27....	3.33	29.0	2.42	154.0	2.27	68	2.57	128	2.85	178	2.46	108
28....	.....	27.0 _e	2.20	147.0	2.17	57	2.58	130	2.65	140	3.18	241
29....	3.66	25.0	3.12	140.0	2.08	48	2.10	55	.....	158 _e	3.03	214
30....	3.72	22.0	.....	.....	2.10	50	2.09	54	2.85	175	2.75	162
31....	3.76	20.0	.....	.....	.....	65 _e	.....	.....	2.45 _x	99	.....	.....

b-b Ice conditions.

e Discharge estimated.

x Outside gauge. Jan. 1 to April 5; May 17 to May 30; Nov. 11 to Dec. 31.

Automatic gauge, April 6 to May 16; May 31 to Nov. 10.

DAILY GAUGE HEIGHT AND DISCHARGE of North branch of Milk river at Peters' ranch, for 1916
—Concluded

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	2 43	102	2 11	56	2 25	78	2 15	53	2 15	53	.....	49 0e
2	2 38	93	2 11	56	2 25	78	2 18	56	2 17	55	2 11	48 0
3	2 40	96	2 11	56	2 76	170	2 18	56	2 16	54	2 12	48 0
4	2 34	86	2 12	57	3 08	230	2 21	59	2 15	53	2 10	47 0
5	2 28	78	2 15	61	2 49	122	2 26	65	2 15	53	2 18	47 0
6	2 27	76	2 13	58	2 29	82	2 37	80	2 12	50	2 20	47 0
7	2 25	74	2 13	58	2 27	76	2 37	80	2 16	54	2 13	47 0
8	2 28	78	2 18	64	2 26	75	2 25	64	2 38	81	2 35	46 0
9	2 28	78	2 73	158	2 24	72	2 21	60	2 18	56	2 43	45 0
10	2 23	71	2 62	137	2 26	74	2 22	60	2 06	44	2 38	44 0
11	2 18	64	2 44	104	2 21	67	2 24	63	2 23xb	46	2 36	42 0
12	2 18	64	2 32	83	2 18	63	2 23	62	2 24	48	2 36	41 0
13	2 19	66	2 42	100	2 22	67	2 20	58	.....	50e	2 38	40 0
14	2 18	64	2 39	95	2 31	79	2 16	54	.....	52e	2 25	40 0
15	2 14	60	2 25	74	2 28	75	2 15	53	2 49	53	2 33	38 0
16	2 12	57	2 22	70	2 25	70	2 15	53	2 41	55	2 37	37 0
17	2 18	64	2 31	82	2 21	65	2 18	56	2 37	56	2 45	36 0
18	2 27	76	2 60	134	2 20	63	2 23	62	2 42	56	2 41	35 0
19	2 25	74	2 38	93	2 18	61	2 24	63	2 37	56	2 38	34 0
20	2 22	70	2 30	80	2 17	59	2 31	72	2 10	56	2 41	32 0
21	2 18	64	2 30	80	2 17	59	2 39	85	.....	56e	2 50	30 0
22	2 16	62	2 29	79	2 16	57	2 31	72	.....	56e	2 53	28 0
23	2 13	58	2 27	77	2 16	57	2 22	60	.....	56e	2 51	26 0
24	2 16	62	2 31	82	2 14	55	2 21	60	2 02	56	2 52	24 0
25	2 19	66	2 33	86	2 10	50	2 19	57	2 22	55	2 53	21 0
26	2 25	74	2 33	87	2 11	51	2 19	57	2 12	54	2 51	19 0
27	2 44	104	2 30	83	2 18	58	2 22	60	2 05	54	2 52	17 0
28	2 28	78	2 29	82	2 15	53	2 19	57	2 09	53	2 49	15 2
29	2 15	61	2 29	82	2 14	52	2 16	54	.....	52e	2 41	13 8
30	2 10	55	2 30	84	2 13	51	2 15	53	.....	51e	2 47	15 0
31	2 10	55	2 27	80	.....	.....	2 17	55	.....	.....	2 20b	17 0

b-b Ice conditions, Nov. 11 to Dec. 31.
e Discharge estimated.
x Outside gauge, Jan. 1 to April 15; May 17 to May 30; Nov. 11 to Dec. 31.
Automatic gauge, April 6 to May 16; May 31 to Nov. 10.

MONTHLY DISCHARGE of North branch of Milk river at Peters' ranch, for 1916
(Drainage area 101 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January	35	20.0	31	0.307	0.35	1,906
February	180	5.5	102	1.010	1.09	5,867
March	189	36.0	80	0.792	0.91	4,919
April	130	54.0	80	0.792	0.88	4,760
May	225	45.0	82	0.812	0.94	5,042
June	241	68.0	114	1.130	1.26	6,783
July	104	55.0	72	0.713	0.82	4,427
August	158	56.0	83	0.822	0.95	5,103
September	230	50.0	76	0.752	0.84	4,522
October	85	53.0	61	0.604	0.70	3,751
November	81	44.0	54	0.535	0.60	3,213
December	49	13.8	34	0.337	0.39	2,091
The year	.....	.....	.....	.....	9.64	52,384

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE of Milk river at Peters' ranch

Area of watershed 101 square miles

Average run-off per square mile 309.1 acre-feet

YEAR	Jan. Sec.-ft.	Feb. Sec.-ft.	Mar. Sec.-ft.	April Sec.-ft.	May Sec.-ft.	June Sec.-ft.	July Sec.-ft.	Aug. Sec.-ft.	Sept. Sec.-ft.	Oct. Sec.-ft.	Nov. Sec.-ft.	Dec. Sec.-ft.	Total Acre-ft.
1909	.....	.....	.....	38b	34	32	173a	53	48	50	52b	.....	8,305a
1910	.....	.....	.....	62a	60	75	26	21	26	21	27	.....	13,256a
1911	.....	.....	.....	51b	58	31	36	41	65	38	43a	.....	20,779a
1912	.....	.....	.....	51b	58	31	41	22	25	27	34	21a	16,751a
1913	13	21	25	78	59	40	24	22	25	31	28	18	23,128
1914	15	14	30	61	26	18	15	15	15	39	31	20	18,051
1915	16	17	65	41	37	120	102	68	78	73	51	40	42,857
1916	31	102	80	80	82	114	72	83	76	61	54	34	52,384
Ave. sec.-ft.	19	38	50	58	51	61	45	41	45	43	39	28	34,105
Ave. ac.-ft.	1,168	2,110	3,074	3,451	3,136	3,630	2,767	2,522	2,678	2,644	2,320	1,722	31,222

a Records incomplete omitted from averages.

b Reduced to a monthly average

SOUTH BRANCH OF MILK RIVER AT CROFF'S RANCH

Location.—On the SW. $\frac{1}{4}$ Sec. 29, Tp. 37N, Rge. 9, West Principal Meridian, Montana, U.S.A.*Records available.*—April 13, 1913, to December 31, 1916.*Gauge.*—Stevens continuous water stage recorder; elevation of zero maintained at 87.08 feet since establishment.*Bench-mark.*—Iron pipe; assumed elevation 100.00 feet.*Channel.*—Permanent except in high water.*Discharge measurements.*—During high stages from cable; during ordinary stages by wading.*Remarks.*—This station is maintained in conjunction with the United States Geological Survey.

DISCHARGE MEASUREMENTS of South branch of Milk river at Croff's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 11	W. A. Lamb (U.S.G.S.)	80.0	324.0	4.41	6.25	1,430
Mar. 17	S. H. Frame	75.0	131.0	1.74	3.86	229
April 7	do	75.0	108.0	1.45	3.47	157
April 26	do	75.0	112.0	1.34	3.41	150
April 26	W. A. Lamb (U.S.G.S.)	76.0	90.0	1.73	3.45	156
May 24	A. H. Tuttle and W. A. Lamb (U.S.G.S.)	73.0	113.0	1.99	3.70	225
June 1	S. H. Frame	77.0	155.0	2.55	4.25	395
June 11	A. H. Tuttle (U.S.G.S.)	76.0	161.0	2.54	4.45	411
June 21	S. H. Frame	77.0	166.0	2.61	4.38	433
June 27	do	78.0	173.0	2.71	4.35	468
July 19	W. A. Lamb (U.S.G.S.)	78.0	78.0	1.87	3.33	146
July 24	W. A. Burton	70.0	82.0	1.16	3.15	95
Aug. 22	W. A. Lamb (U.S.G.S.)	44.5	49.0	1.57	3.01	77
Sept. 6	S. H. Frame	75.0	82.0	1.37	3.22	113
Sept. 19	W. A. Lamb (U.S.G.S.)	35.0	35.6	1.46	2.83	52
Sept. 28	S. H. Frame	33.0	26.4	1.99	2.88	53
Nov. 16	do	37.0	31.2	1.70	2.90	53

DAILY GAUGE HEIGHT AND DISCHARGE of South branch of Milk river at Croff's ranch, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	2.70x	28	2.70	28	3.05	75	3.71	220	3.61	194	4.31	419
2....	2.65	24	2.70	28	3.05	75	3.84	257	3.87	266	4.52	509
3....	2.70	28	2.70	28	3.05	75	3.73	225	3.82	251	4.09	334
4....	2.70	28	2.75	34	3.10	83	3.57	184	3.78	239	3.89	266
5....	.....	28e	2.75	34	3.05	75	3.49	165	3.79	242	3.90	206
6....	.....	28e	2.70	28	3.05	75	3.41	147	3.78	239	4.14	338
7....	.....	28e	2.70	28	3.05	75	3.46	158	3.76	234	3.94	266
8....	.....	28e	2.65	24	3.25	111	3.53	174	3.76	234	3.81	223
9....	.....	28e	2.70	28	5.30	900	3.64	201	3.66	207	3.75	201
10....	.....	28e	2.70	28	6.60x	1,640	3.69	214	3.64	201	4.08	291
11....	2.70	28	2.70	28	6.40x	1,520	3.70	217	3.58	186	4.36	381
12....	2.70	28	2.75	34	.....v	1,300	3.79	242	3.57	184	4.22	334
13....	2.70	28	2.75	34	.....v	777	3.76	234	3.57	184	3.94	251
14....	2.70	28	2.75	34	4.65	568	3.65	204	3.58	186	3.86	231
15....	2.70	28	2.80	39	.....v	448	3.70	217	3.60	191	3.80	217
16....	2.65	24	8.60	2,840	.....v	346	3.82	251	3.61	194	3.81	223
17....	2.60	19	7.00	1,880	.....v	308	3.69	214	3.58	186	3.82	228
18....	2.65	24	5.95	1,260	.....v	293	3.62	196	3.53	174	3.85	239
19....	2.70	28	5.10	792	3.94	281	3.62	196	3.49	165	3.90	257
20....	2.70	28	5.90	1,230	4.02	314	3.59	189	3.47	160	4.20	359
21....	2.70	28	5.30	900	4.14	355	3.54	177	3.46	158	4.38	431
22....	2.70	28	4.15	359	4.02	314	3.54	177	3.45	156	4.62	545
23....	2.65	24	4.15	359	3.76	234	3.53	174	3.46	158	4.75	616
24....	2.65	24	4.15	359	3.63	199	3.56	181	3.62	196	4.34	439
25....	2.65	24	4.10	341	3.60	191	3.53	174	3.85	260	4.10	359
26....	2.60	19	3.90	275	3.58	186	3.43	152	.....v	322	4.14	381
27....	2.65	24	3.15	92	3.66	207	3.51	169	.....v	616	4.31	460
28....	2.70	28	3.15	92	3.68	212	3.65	204	4.77	626	.....v	484
29....	2.70	28	3.10	83	3.59	189	3.68	212	.....v	484	.....v	536
30....	2.75	34	.....	.....	3.55	179	3.64	201	4.70	592	4.82	670
31....	2.70	28	.....	.....	3.53	174	.....	.....	4.39	451	.....	.....

e Discharge estimated.

x Chain gauge heights January 1 to March 10; automatic gauge heights March 11 to September 19.

v Discharge obtained by hourly method from automatic gauge record.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of South branch of Milk river at Croff's ranch, for 1916.—
Concluded.

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	4.09	467	3.07	85	2.90	59	2.90	59	3.00	74	2.80	45
2....	3.70 ^x	338	2.99	72	2.90	59	2.90	59	3.00	74	2.80	45
3....	4.02	314	2.94	65	.....^v	95	2.95	66	2.95	66	2.85	52
4....	3.99	304	2.91	60	.....^v	279	3.00	74	3.00	74	2.80	45
5....	3.88	269	2.88	56	.....^v	202	3.10	90	2.95	66	2.85	52
6....	3.79	212	2.88	56	3.23	112	3.15	98	3.00	74	2.80	45
7....	3.70 ^x	217	2.87	55	3.08	87	3.10	90	3.00	74	2.80	45
8....	.....^x	217 ^e	2.86	53	3.02	77	3.15	98	2.50	18	2.85	52
9....	3.70	217	.....^v	84	2.98	71	3.15	98	2.55	22	.....	48
10....	3.60	191	.....^v	222	2.97	70	3.10	90	2.55	22	2.80	45
11....	3.50	167	3.50	167	2.96	68	3.15	98	.....	37	2.70	34
12....	3.55	179	3.28	121	2.95	66	3.15	98	2.85	52	2.70	34
13....	3.40	145	3.16	100	2.94	65	3.10	90	2.80	45	2.75	40
14....	3.40	145	3.20	107	2.89	58	3.10	90	2.80	45	2.70	34
15....	3.40	145	3.16	100	2.92	62	3.05	82	2.85	52	2.75	40
16....	3.30	125	3.04	80	2.90	59	3.05	82	2.85	52	2.65	30
17....	3.40 ^x	145	3.00	74	2.89	58	3.00	74	2.95	66	2.65	30
18....	3.40 ^x	145	3.18	104	2.86	53	3.00	74	2.90	59	2.70	30
19....	3.35	135	3.41	147	2.83 ^x	40	3.00	74	3.00	74	2.70	30
20....	3.25	116	3.22	111	.....	48 ^e	3.05	82	3.00	74	2.75	30
21....	3.21	109	3.11	92	.....	47 ^e	3.00	74	2.95	66	2.75	29
22....	3.17	102	3.02	77	.....	47 ^e	3.00	74	2.95	66	2.70	29
23....	3.16	100	3.00	74	.....	46 ^e	3.00	74	3.00	64	2.75	29
24....	3.15	98	2.96	68	2.80 ^x	45	2.95	66	3.00	62	2.80	29
25....	3.14	97	2.94	65	2.80	49	2.90	59	2.90	59	2.80	29
26....	3.14	97	2.93	64	.....	49 ^e	2.90	59	2.90	59	2.80	28
27....	3.27	120	2.98	71	.....	53 ^e	2.95	66	2.80	45	2.85	28
28....	3.44	154	2.97	70	2.88	56	3.00	74	2.80	45	2.80	28
29....	3.23	112	2.94	65	.....	58	2.95	66	2.80	45	2.75	28
30....	3.16	100	2.93	64	2.90	59	2.95	66	2.85	52	2.70	28
31....	3.12	93	2.91	60	.....	.....	2.95	66	.....	.....	2.70	28

^e Discharge estimated.

^x Automatic gauge heights March 11 to July 7; July 18 to September 19; chain gauge heights July 8 to July 17; September 24 to December 31.

^v Discharge obtained by hourly method from automatic gauge record.

MONTHLY DISCHARGE of South branch of Milk river at Croff's ranch, for 1916

(Drainage area 288 square miles)

MONTH	DISCHARGE IN SECOND-FOOT				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	34	19	26.7	0.093	0.11	1,642
February.....	2,840	24	390.0	1.350	1.46	22,433
March.....	1,640	75	380.0	1.320	1.52	23,365
April.....	257	147	198.0	0.688	0.77	11,782
May.....	625	156	262.0	0.910	1.05	16,110
June.....	670	201	358.0	1.240	1.38	21,302
July.....	467	93	174.0	0.604	0.70	10,699
August.....	222	53	86.7	0.301	0.35	5,331
September.....	279	45	73.5	0.255	0.28	4,374
October.....	98	59	77.7	0.270	0.31	4,780
November.....	74	18	56.1	0.195	0.22	3,340
December.....	52	28	36.1	0.125	0.14	2,220
The year.....					8.29	127,378

MEAN MONTHLY DISCHARGE of Milk river at Croff's ranch

Area of watershed 288 square miles

Average run-off per square mile 263.8 acre-feet

YEAR	Jan. Sec.-ft.	Feb. Sec.-ft.	Mar. Sec.-ft.	April Sec.-ft.	May Sec.-ft.	June Sec.-ft.	July Sec.-ft.	Aug. Sec.-ft.	Sept. Sec.-ft.	Oct. Sec.-ft.	Nov. Sec.-ft.	Dec. Sec.-ft.	Total Acre-ft.
1905					51	49	24	8	4	17a			8,850a
1906				40	76	91	13	11	7	14	24		17,400
1907				67a	301	378	148	55	94	52	41a		67,000
1908				402	267		d	71	47	84	103		58,800a
1909						334	185	60	38	34	49		42,300a
1910	25b	25b	65b	129	114	68	18	11	33	32	28	25b	34,600
1911				253a	267	207	94	61	128	62			53,700
1912				239	196	77	83	37	34	45	38		45,900
1913				479	312	200	79	44	23	52	31		63,421
1914			86a	220	120	63	17	14	17	64	36	18	37,262
1915	12	15	74	84	125	264	152	63	118	80	56	43	65,730
1916	27	390	380	198	262	358	174	87	74	78	56	36	127,378
Average Sec.-ft.	21	143	173	224	190	189	99	44	51	54	47	28	56,933
Average Acre-ft.	1,291	7,942	10,637	13,328	11,683	11,246	6,087	2,705	3,035	3,320	2,797	1,722	75,792

a Records incomplete, omitted from averages.

b Estimated flow.

d Big flood, no records.

SOUTH BRANCH OF MILK RIVER AT MACKIE'S RANCH

Location.—On the NW. $\frac{1}{4}$ Sec. 31, Tp. 1, Rge. 18, W. 4th Mer.

Records available.—July 14, 1909, to October 31, 1915.

Remarks.—This station was not maintained during 1916.

MEAN MONTHLY DISCHARGE in Second-feet of South branch of Milk river at Mackie's ranch

MONTH	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	Mean in Sec.-ft.	Mean in Acre-ft.
October		30	74	43.01	68.0	70h	93	62	3,872
November		38a	84c	42.00e					
December									
January									
February									
March									
April	138.0	258b	222d	430.00f	292.0g	73		106	6,270
May	121.0	275	209	332.00	102.0h	130		213	13,124
June	71.0	254	79	216.00	60.0	249		155	9,215
July	15.0	90	64	100.00	15.0	139		70	4,331
August	4.4	54	36	51.00	10.3	61		36	2,230
September	31.0	141	33	18.40	11.4	130		61	3,614
Total in acre-ft.	22,922	60,310	42,145	68,924	16,677	51,492			42,656

a 1-27.

b 17-30.

c 1-3.

d 5-30.

e 1-16.

f 6-30.

g 4-10.

h 6, 20-31.

SESSIONAL PAPER No. 25b

MILK RIVER AT MILK RIVER

Location.—On the NE. $\frac{1}{4}$ Sec. 21, Tp. 2, Rge. 16, W. 4th Mer.

Records available.—July 1, 1909, to December 31, 1916.

Gauge.—Vertical staff used from establishment of station until February 16, 1916, when a new box-chain gauge was placed on railway bridge. Zero of gauge maintained at elevation of 3,403.39. Gauge read by Dan O'Connell.

Bench-mark.—Permanent iron bench-mark; elevation 3,412.42 feet above mean sea-level. (Geodetic Survey of Canada).

Channel.—The stream flows in one channel at all stages; bed consists of sand and fine gravel.

Discharge measurements.—At low stages by wading; at high stages from traffic bridge 150 feet above the gauge.

Accuracy.—Except during ice conditions and periods of high water, stage-discharge relation permanent. Twelve open water measurements were taken by means of which a rating curve was drawn representing average conditions. Gauge read daily to tenths and hundredths. Daily discharge ascertained by applying mean daily gauge heights to rating table from February 19 to March 29; April 1 to May 9, and July 20 to November 7. Bolster method used February 17 and 18, and between May 10 and July 19. Daily discharge during ice conditions ascertained from hydrograph derived by plotting five discharge measurements, mean daily gauge height and temperatures.

DISCHARGE MEASUREMENTS of Milk river at Milk River, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 4	W. H. Storey	46.5	48.4	0.69	2.30 ^b	34.0
Feb. 1	V. A. Newhall	39.0	54.7	0.23	3.10 ^b	12.6
Feb. 18	G. H. Whyte	130.7	675.3	4.92	8.06	3,323.0
Feb. 19	do	130.7	542.2	3.59	7.04	1,944.0
Mar. 6	L. J. Gleeson	84.0	72.6	0.69	3.29 ^b	50.0
Mar. 22	S. H. Frame	119.8	288.4	2.09	2.96	602.0
April 12	do	119.0	200.0	1.81	2.21	361.0
May 10	do	120.0	191.4	1.60	2.08	306.0
May 30	do	121.0	342.5	2.61	3.14	893.0
June 20	W. A. Burton	119.6	226.3	1.78	2.32	403.0
June 23	J. E. Degnon	120.0	340.7	2.40	3.09	815.0 ^c
July 19	W. A. Burton	119.0	181.5	1.68	2.01	306.0
Aug. 10	S. H. Frame	120.0	283.6	2.15	2.91	610.0
Aug. 31	do	118.0	116.2	1.46	1.56	169.0
Oct. 12	do	120.0	157.6	1.32	1.81	219.0
Dec. 5	H. W. Rowley	121.0	101.0	1.03	2.09 ^b	115.0
Dec. 26	do	120.0	85.0	0.86	2.46 ^b	73.0

^b Ice conditions from Jan. 1 to Feb. 16; Mar. 1 to March 9; Nov. 8 to Dec. 31.

^c Discharge estimated by surface velocities.

DAILY GAUGE HEIGHT AND DISCHARGE of Milk river at Milk River, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	2 15 ^b	38.0	3.10	12.6	3.41	310	2 14	341	2 14	341	3.08	854
2....	2 20	36.0	3.25	12.8	2.90	250	2 34	407	2 15	344	3.08	840
3....	2 23	35.0	3.50	13.2	3.25	180	2 54	472	2.49	456	3.12	845
4....	2 30	34.0	3.60	13.8	3.08	120	2 24	374	2 19	358	2.68	685
5....	2.40	33.0	3.58	14.0	3.57	54	2.09	325	2.19	358	2.53	630
6....	2.45	33.0	3.80	14.2	3.29	50	1.99	292	2.24	374	2.88	735
7....	2.50	32.0	3.80	15.0	3.25	140	1.97	286	2.14	341	2.81	705
8....	2.55	31.0	3.80	17.0	3.19	280	1.96	292	2.06	315	2.44	573
9....	2.55	31.0	4.02	20.0	3.36 ^b	420	2.19	358	2.16	348	2.38	542
10....	2.50	29.0	4.05	24.0	5.09	1,306	2.19	358	2.06	300 ^s	2.28	500
11....	2.60	24.0	4.27	40.0	6.69	1,829	2.24	374	2.08	325	2.73	634
12....	2.75	22.0	3.65	160.0	5.94	1,583	2.21	364	1.98	300	3.13	760
13....	2.85	21.0	3.55	290.0	4.84	1,224	2.27	384	1.99	320	2.67	595
14....	2.85	20.0	3.40	420.0	3.74	864	2.14	341	2.01	335	2.38	490
15....	2.87	20.0	3.35	550.0	3.04	636	2.14	341	2.04	353	2.35	470
16....	2.95	20.0	3.70 ^b	680.0	2.99	619	2.27	384	2.04	367	2.23	427
17....	2.85	21.0	8.50	3,467.0 ^s	3.14	668	2.19	358	2.08	420	2.18	395
18....	2.90	22.0	8.13	3,346.0 ^s	2.69	521	2.06	315	1.99	368	2.20	395
19....	3.07	24.0	7.03	1,940.0	2.74	537	2.01	299	1.94	365	2.23	385
20....	2.82	25.0	6.73	1,842.0	2.79	554	2.04	309	1.91	372	2.32	403
21....	2.81	24.0	5.94	1,583.0	2.94	603	1.99	292	1.84	360	2.63	555
22....	2.84	23.0	5.18	1,335.0	2.96	609	1.94	276	1.89	393	2.83	680
23....	2.83	22.0	4.78	1,204.0	2.64	505	1.97	286	2.02	443	3.09	815
24....	2.85	21.0	4.38	1,074.0	2.39	423	1.94	276	2.27	533	3.16	840
25....	3.00	20.0	4.19	1,012.0	2.19	358	1.87	253	2.70	686	2.65	667
26....	3.00	19.0	4.22	1,021.0	2.14	341	1.94	276	3.28	890	2.53	618
27....	3.13	18.0	3.94	929.0	2.19	358	1.91	266	3.28	905	2.76	688
28....	3.20	16.0	3.71	855.0	2.28	387	2.04	309	3.69	1,048	2.96	750
29....	3.50	15.0	3.26 ^b	370.0	2.19	358	2.24	374	3.44	980	3.46	905
30....	3.65	14.0	.....	.....	2.09	325	2.27	384	3.14	893	3.68	967
31....	3.35	13.0	.....	.....	1.87	253	.....	.....	3.30	933	.....	.....

^b Ice conditions from Jan. 1 to Feb. 16; Feb. 29 to Mar. 9; Nov. 8 to Dec. 31.^s Shifting conditions, Feb. 17 and 18; May 10 to July 19.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Milk river at Milk River, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	3.39	870	1.58	167	1.45	133	1.58	139	1.70	200	2.03	118
2....	2.99	730	1.57	164	1.43	128	1.62 ^x	146	1.71	203	2.13	117
3....	2.66	620	1.53	154	1.65	185	1.57	164	1.66	188	2.11	116
4....	2.55	580	1.48	141	2.35	410	1.60	172	1.70	200	2.13	116
5....	2.48	550	1.47	138	3.43	763	1.56	162	1.71	203	2.12	115
6....	2.28	475	1.48	141	2.73	534	1.72	206	1.72	206	2.13	114
7....	2.18	435	1.48	141	2.13	338	1.96	282	1.65	185	2.10	113
8....	2.28	467	1.48	141	1.90	263	1.96	282	1.50 ^b	177	2.03	112
9....	2.23	445	1.83	240	1.94 ^x	300	1.93	273	1.53	171	2.00	111
10....	2.18	420	2.91	593	1.82	232	1.85	246	1.95	164	1.96	109
11....	2.06	372	2.65	508	1.78	223	1.80	230	1.45	157	2.00	108
12....	2.05	367	2.20	361	1.76	200	1.81	233	1.65	152	2.02	106
13....	1.98	333	1.96	282	1.73	183	1.85	246	1.75	148	2.05	104
14....	1.87	290	1.78	224	1.69	185	1.80	230	1.95	144	2.10	102
15....	1.83	275	1.90	263	1.70	187	1.75	215	1.90	142	2.15	100
16....	1.78	255	1.76	218	1.73	190	1.76	218	2.05	139	2.10	98
17....	1.88	280	1.68	194	1.70	182	1.77	221	2.03	137	2.05	95
18....	1.93	292	1.73	209	1.65	173	1.71	203	2.05	134	2.10	92
19....	2.01	306 ^s	2.01	299	1.63	163	1.69	197	2.35	133	2.10	87
20....	1.96	282	2.10	328	1.56	151	1.71	203	2.27	131	2.10	81
21....	1.83	240	1.83	240	1.55	141	1.75	215	2.26	129	2.15	78
22....	1.66	188	1.78	224	1.53	139	1.80	230	2.30	127	2.10	76
23....	1.60	172	1.73	209	1.52	135	1.85	246	2.33	126	2.25	75
24....	1.66	188	1.68	194	1.51	132	1.80	230	2.32	124	2.35	74
25....	1.68	194	1.63	180	1.50	127	1.75	215	2.27	123	2.45	74
26....	1.68	194	1.62	177	1.50	139	1.80	230	2.20	122	2.46	73
27....	1.76	218	1.60	172	1.52	146	1.80	230	2.23	121	2.50	73
28....	1.86	250	1.63	180	1.56	148	1.75	215	2.22	120	2.50	73
29....	2.00	295	1.63	180	1.62	152	1.73	209	2.16	119	2.54	73
30....	1.78	324	1.59	169	1.60	146	1.73	209	2.10	118	2.50	73
31....	1.64	182	1.56	162	.....	.....	1.73	209	.....	.....	2.50 ^b	72

b Ice conditions from Jan. 1 to Feb. 16; Feb. 29 to Mar. 9; Nov. 8 to Dec. 31.

s Shifting conditions, Feb. 17 to Feb. 18; May 10 to July 19.

x Sept. 9 to Oct. 2, mean daily gauge heights from automatic record; discharges from hydrograph "Seepage Investigations on Milk river."

MONTHLY DISCHARGE of Milk river at Milk River, for 1916

(Drainage area 1,104 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	38	13.0	24	0.022	0.03	1,476
February.....	3,467	12.6	768	0.696	0.75	44,176
March.....	1,829	50.0	538	0.487	0.56	33,080
April.....	472	253.0	332	0.301	0.34	19,755
May.....	1,048	300.0	488	0.442	0.51	30,006
June.....	967	385.0	645	0.584	0.65	38,380
July.....	870	172.0	354	0.321	0.37	21,767
August.....	593	138.0	226	0.205	0.24	13,806
September.....	763	127.0	218	0.197	0.22	12,972
October.....	282	139.0	216	0.196	0.23	13,281
November.....	206	118.0	151	0.137	0.15	8,985
December.....	118	72.0	94	0.085	0.10	5,780
The year.....					4.15	243,554

MEAN MONTHLY DISCHARGE of Milk river at Milk River

Area of watershed 1,104 square miles

Average run-off per square mile 111.5 acre-feet

YEAR	Jan. Sec.-ft.	Feb. Sec.-ft.	Mar. Sec.-ft.	April Sec.-ft.	May Sec.-ft.	June Sec.-ft.	July Sec.-ft.	Aug. Sec.-ft.	Sept. Sec.-ft.	Oct. Sec.-ft.	Nov. Sec.-ft.	Dec. Sec.-ft.	Total Acre-ft.
1909.....				204	174	99	299	129	78	72	120a		13,449a
1910.....				308	399	355	128	91	252	119	126	79	38,477a
1911.....	38	77	242	565	293	105	126	62	65	81	90b	136	112,130
1912.....	7	8	7	745	415	256	118	73	41	87	60	45	106,007
1913.....	25	10	92	317	159	71	25	22	28	133	80	28	112,333
1914.....	26	27	253	174	180	432	263	151	225	192	122	63	59,241
1915.....	24	768	538	332	488	645	354	226	218	216	151	94	127,567
1916.....													243,554
Average sec.-ft....	24	178	226	377	300	280	168	97	120	119	105	54	126,806
Average acre-ft....	1,476	9,886	13,896	22,433	18,446	16,661	10,330	5,964	7,140	7,317	6,248	3,320	123,117

a Records incomplete omitted from averages.

b Discharge estimated.

MILK RIVER AT WRITING-ON-STONE POLICE DETACHMENT

Location.—On SW. $\frac{1}{4}$ Sec. 35, Tp. 1, Rge. 13, W. 4th Mer.

Records available.—August 2, 1909, to October 31, 1915.

Remarks.—This station was not maintained during 1916.

MEAN MONTHLY DISCHARGE of Milk river at Writing-on-Stone

Area of watershed 1,546 square miles

Average run-off per square mile 53.9 acre-feet

YEAR	Mar. Sec.-ft.	April Sec.-ft.	May Sec.-ft.	June Sec.-ft.	July Sec.-ft.	Aug. Sec.-ft.	Sept. Sec.-ft.	Oct. Sec.-ft.	Nov. Sec.-ft.	Total Acre-ft.
1909.....						145	81	78	108	14,656a
1910.....		207	184	108	33	18	53	49	50a	40,556
1911.....	479a	317	371	334	161	96	244	134	166a	110,636
1912.....		226a	93a	130a	68	64	78	79		34,626a
1913.....		751	415	279	139	72	48	81	64	111,438
1914.....	163a	296	160	85	30	17	26	117		48,695
1915.....	543a	213	204	467	275	162	227	173		117,994
Average Sec.-ft....		357	267	255	128	83	106	101	84	85,864
Average Acre-ft....		21,243	16,417	15,174	7,870	5,103	6,307	6,210	4,998	83,322

a Records incomplete; not included in average.

DEER CREEK AT DICKINSON'S RANCH

Location.—On the SW. $\frac{1}{4}$ Sec. 15, Tp. 1, Rge. 12, W. 4th Mer.Records available.—May 26, 1911, to November 7, 1911; May 3, 1915, to October 31, 1915.
Discharge measurements only in 1912-14.

Gauge.—Vertical staff; zero elevation maintained at 90.72 feet since establishment.

Bench-mark.—Permanent iron bench-mark, assumed elevation 100.00 feet.

Channel.—One channel at all stages.

Discharge measurements.—At low stages made by wading; at high stages could be made from traffic bridge two hundred feet above gauge.

Remarks.—This station was not maintained during 1916.

SESSIONAL PAPER No. 25B

DISCHARGE MEASUREMENTS of Deer creek at Dickinson's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
March 10.....	L. J. Gleeson.....	10.5	3.05	2.58	2.41	7.9

DEER CREEK CATTLE COMPANY EAST DITCH FROM DEER CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 36, Tp. 1, Rge. 12, W. 4th Mer.

Records available.—April 1, 1912, to November 23, 1912; March 31, 1915, to September 11, 1915. Discharge measurements only during 1914, and March 31 to June 7, 1915.

Gauge.—Vertical staff; elevation of zero maintained at 93.49 feet since establishment.

Bench-mark.—Permanent iron bench-mark located 250 feet below headgates; assumed elevation 100.00 feet.

Discharge measurements.—Made with current-meter by wading or with a weir.

Observer.—F. W. Webster.

Remarks.—The Deer Creek Cattle Company diverts all the water from Deer creek through their two ditches, except in flood stages. No records were obtained during 1915, but it is understood that water was diverted and used for irrigation purposes during April.

DEER CREEK CATTLE COMPANY WEST DITCH FROM DEER CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 36, Tp. 1, Rge. 12, W. 4th Mer.

Records available.—May 17 to July 27, 1915. Discharge measurements during 1914 and parts of May and July, 1915.

Gauge.—Vertical staff; zero maintained at elevation of 100.50 feet since establishment.

Bench-mark.—Permanent iron bench-mark at East Ditch station; assumed elevation 100.00 feet.

Discharge measurements.—Made with current-meter by wading or with a weir.

Observer.—F. W. Webster.

Remarks.—No records were obtained during 1916, and it is understood that very little, if any, water was diverted through this ditch during 1916.

FORNFEIST DITCH NEAR ST. KILDA

Location.—On the SW. $\frac{1}{4}$ Sec. 31, Tp. 1, Rge. 11, W. 4th Mer.

Records available.—From September 16, 1915, to October 31, 1915.

Gauge.—Vertical staff; zero maintained at elevation of 98.45 feet since establishment.

Bench-mark.—Temporary wooden bench-mark; assumed elevation 100.00 feet.

Discharge measurements.—Made with current-meter by wading or by weir.

Observer.—Julius Fornfeist.

Note.—Water was diverted during 1916, but no records have been obtained.

MILK RIVER AT PENDANT D'OREILLE POLICE DETACHMENT

Location.—On the SW. $\frac{1}{4}$ Sec. 21, Tp. 2, Rge. 8, W. 4th Mer.

Records available.—August 5, 1909, to October 31, 1915.

Gauge.—Vertical staff; zero maintained at elevation of 82.45 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Composed of sand and shifts in change of stage.

Discharge measurements.—Made from a cable and car during high water; at low stages by wading.

Remarks.—Two discharge measurements only in 1916.

DISCHARGE MEASUREMENTS of Milk river at Pendant D'Oreille police detachment, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 12.	L. J. Gleeson.	184	650	5.83	6.53	3,782
April 2.	do.	107	194	1.21	3.05	355

MEAN MONTHLY DISCHARGE of Milk river at Pendant D'Oreille

Area of watershed 2,169 square miles

Average run-off per square mile 41.9 acre-feet

YEAR	Mar. Sec.-ft.	April Sec.-ft.	May Sec.-ft.	June Sec.-ft.	July Sec.-ft.	Aug. Sec.-ft.	Sept. Sec.-ft.	Oct. Sec.-ft.	Nov. Sec.-ft.	Total Acre-ft.
1909.						121b	76	85	110	14,656a
1910.		189	186	90	29	11	22	47	44a	35,371
1911.		366	419	382	228	111	417	176	135a	128,898
1912.		325a	326	127	136	72	64	82	96a	54,220
1913.		894b	493	306	146	95	32	71		113,955
1914.	171a	358	145	81	26	11	23	155		53,979
1915.	578a	260	226	580	320	187	211	179		136,703
Average Sec.-ft.	413	299	261	147	87	121	114	73b		87,188
Average Acre-ft.	240,575	18,385	15,531	9,039	5,349	7,200	7,010	4,344		91,400

a Records not complete, omitted from average.

b Reduced to monthly average.

MILK RIVER AT SPENCER'S LOWER RANCH

Location.—South of SE. $\frac{1}{4}$ Sec. 3, Tp. 1, Rge. 5, W. 4th Mer.*Records available.*—August 7, 1909, to December 25, 1915.

Gauge.—Gurley automatic water stage register installed in a wooden shelter, three hundred feet south of the international boundary, with a staff gauge inside the stilling box and another outside at the mouth of the intake pipe. Gauges are maintained at an elevation of 2,696.58 feet. Staff gauge read once daily by Frank Galloway.

Bench-marks.—Permanent iron bench-mark; elevation 2713.64 feet (U.S.G.S. Havre datum) located on the left bank, 1,300 feet up stream from the boundary line.

Channel.—Composed of gravel, rock and quicksand and is subject to shifting conditions.

Discharge measurements.—Made by wading at low stages and by a cable car structure at high stages.

Winter flow.—From December to April the stream is frozen over and no records of value are obtained.

Co-operation.—This station is maintained in conjunction with United States Geological Survey.

Accuracy.—Stage-discharge relation permanent except during periods of high water and ice; numerous discharge measurements are therefore necessary to define rating curves and periods of shifting control.

Discharge applied as follows:—January 1 to March 13, estimated, based on discharge measurements, temperatures and discharge at Milk river; March 14 to 28, based on gauge heights and discharge measurements at cable; March 29 to 31, based on measurement March 31; April 1 to 12, Bolster method for shifting control; April 13 to May 5, well defined curve between 300 second-feet and 400 second-feet; May 6 to 17, Bolster method for shifting control; May 18 to 24, based on measurement May 17; May 25 to June 12, based on measurement June 12; June 12 to 13, Bolster method for shifting control; June 14, to September 6, well defined curve between 160 second-feet and 840 second-feet; September 7 to 13, Bolster method for shifting control; September 14 to November 2, Bolster method for shifting control; discharge estimated from November 5 to December 31.

Mean daily gauge heights found by averaging gauge heights registered by Gurley weight driven water stage register. Daily discharge ascertained by applying daily gauge heights to rating table except for periods during which stage-discharge relation is affected by shifting control or ice. Results obtained by use of rating tables good; other results, fair.

SESSIONAL PAPER No. 25B

DISCHARGE MEASUREMENTS of Milk river at Spencer's lower ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 14	L. J. Gleeson	136.0	446.8	4.60	6.64	2,064
Mar. 15	W. A. Lamb (U.S.G.S.)	100.0	300.0	3.97	5.51	1,190
Mar. 23	L. J. Gleeson	99.5	224.2	3.49	4.20	766
Mar. 31	do	90.0	188.0	2.25	3.69	413
April 12	do	102.0	183.6	2.13	3.68	392
April 30	W. A. Lamb (U.S.G.S.)	67.0	111.0	2.08	3.36	231
May 5	H. W. Rowley	116.0	156.0	1.90	3.50	297
May 12	A. H. Tuttle (U.S.G.S.)	66.0	111.0	2.59	3.54x	287
May 17	H. W. Rowley	115.0	145.0	1.71	3.50	248
June 12	do	120.0	220.0	3.29	4.37	722
June 14	A. H. Tuttle (U.S.G.S.)	123.0	250.0	3.76	4.81	939
July 7	H. W. Rowley	120.0	260.0	2.64	4.41	686
July 28	do	121.0	143.0	1.59	3.49	228
Aug. 17	do	48.0	127.0	1.98	3.54	251
Sept. 7	W. A. Lamb (U.S.G.S.)	125.0	240.0	4.05	4.67	971
Sept. 13	H. W. Rowley	118.0	152.0	1.68	3.39	255
Oct. 2	H. W. Rowley and V. A. Newhall	41.0	64.7	2.22	3.34	143
Nov. 2	H. W. Rowley	44.0	73.1	2.34	3.35	171

x Outside staff gauge.

DAILY GAUGE HEIGHT AND DISCHARGE of Milk river at Spencer's lower ranch, for 1916

DAY	January		February		March		April		May		June		
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	
1.....			2.80				700e	3.56	344	3.48	289	5.01	1,130
2.....	3.95x		2.95				700e	3.50	314	3.61	354	4.91	1,060
3.....	3.95		3.08				700e	3.42	274	3.65	375	4.68	915
4.....	4.00		3.50				700e	3.58	354	3.54	319	4.73	946
5.....	4.00		3.70				700e	3.78	454	3.58	339	4.82	1,000
6.....	3.95		3.68				700e	3.87	503	3.81	446	4.61	871
7.....	3.96		3.70				700e		484e	3.64	355	4.47	784
8.....	3.96		3.70				700e		465e	3.63	346	4.34	706
9.....	3.98		3.75				700e		447e	3.64	346	4.63	883
10.....	4.00		3.75				700e		428e	3.62	331	4.50	803
11.....	3.90		3.78				700e		410e	3.60	317	4.70	927
12.....	3.89		3.78				700e	3.68	391	3.58	303	4.41	748
13.....	3.90						700e		391e	3.50	267	4.35	688
14.....	3.88		3.80		6.64x	2,060		391e	3.49	258	4.73	896	
15.....	3.85		8.45		4.61	1,190		391e	3.45	237	4.43	712	
16.....	3.80		7.50		4.16	984		391e	3.48	245	4.22	589	
17.....	3.70		7.20		3.81	826		391	3.49	245	4.16	555	
18.....	3.70		6.95		3.90	866		371	406	3.49	245	4.08	510
19.....	3.65					825e		3.72	412	3.49	245	4.12	532
20.....	3.64					784e		3.71	406	3.55	271	3.92	425
21.....			3.50		3.64	744	3.76	433	3.47	237	3.90	415	
22.....	3.60		3.65x		3.79	816	3.67	385	3.39	204	4.39	688	
23.....					3.64	766	3.58	339	3.39	204	4.41	700	
24.....					3.57	706	3.65	375	3.39	204	4.58	803	
25.....	3.00				3.38	602	3.64	370	4.22	635	4.68	865	
26.....	2.80				3.23	520	3.65	375	4.58	852	4.70	877	
27.....	2.70				3.02	408	3.58	339	4.73	946	4.50	754	
28.....	2.55				2.92	356	3.52	309	4.68	915	4.31	641	
29.....	2.45				3.46x	296	3.48	289	4.90	1,060	4.36	670	
30.....	2.50				3.64	396	3.39	245	5.04	1,160	4.73	896	
31.....	2.75				3.63	384			4.92	1,070			

e Discharge estimated.

x Gauge heights January 2 to February 23, from staff at automatic gauge.

Gauge heights March 14 to March 28, from staff at cable.

Gauge heights March 29 to October 31 from automatic gauge.

DAILY GAUGE HEIGHT AND DISCHARGE of Milk river at Spencer's lower ranch, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	5.04	1,100	3.57	258	3.31	155	3.26	120	.....	172	4.25	110e
2.....	5.39	1,370	3.42	196	3.31	155	3.34	144	.....	171	4.25	110e
3.....	.....	3,500e	3.35	170	3.30	151	3.39	162	.....	182	4.20	110e
4.....	.....	2,000e	3.33	162	3.53	341	3.50	204	.....	193	4.20	110e
5.....	.....	1,200e	3.32	158	3.71	322	3.58	237	3.44	204	4.15	110e
6.....	.....	800e	3.29	148	3.79	360	3.63	262	3.45	180e	4.15	100e
7.....	4.39	688	3.32	158	4.67	973	3.59	245	3.45	180e	4.00	100e
8.....	4.28	623	3.90	415	4.25	709	3.47	196	3.45	180e	3.90	100e
9.....	5.53	1,480	3.56	254	3.94	530	3.43	181	3.46	180e	3.50	100e
10.....	4.90	1,000	3.57	258	3.72	412	3.56	232	3.84	180e	3.35	100e
11.....	4.42	706	3.89	410	3.59	344	3.67	285	3.85	120e	3.40	80e
12.....	4.23	594	4.16	553	3.45	274	3.65	276	3.65	120e	3.30	80e
13.....	4.07	505	4.11	527	3.38	240	3.58	245	3.40	120e	3.20	80e
14.....	3.90	415	3.85	390	3.36	232	3.52	220	3.30	120e	3.55	80e
15.....	3.74	336	3.67	303	3.37	232	3.48	204	.....	120e	3.75	80e
16.....	4.02	478	3.57	258	3.38	232	3.49	212	3.08	110e	3.85	60e
17.....	3.99	462	3.54	245	3.35	216	3.49	212	.....	110e	3.85	60e
18.....	3.69	312	3.70	317	3.41	237	3.47	204	3.27	110e	3.80	60e
19.....	3.70	317	3.64	289	3.37	216	3.43	188	3.30	110e	3.85	60e
20.....	3.69	312	3.57	258	3.32	188	3.43	188	3.45	110e	.....	60e
21.....	3.64	289	3.53	241	3.27	166	3.45	200	3.65	110e	3.85	50e
22.....	3.65	294	3.61	276	3.27	162	3.48	212	3.70	110e	3.85	50e
23.....	3.60	271	3.72	327	3.25	151	3.56	245	3.70	110e	3.85	50e
24.....	3.48	224	3.69	312	3.24	144	3.58	254	3.70	110e	3.87	50e
25.....	3.45	208	3.53	241	3.23	137	3.52	228	3.75	110e	.....	50e
26.....	3.47	216	3.42	196	3.21	124	3.51	228	.....	110e	3.87	40e
27.....	3.48	220	3.38	181	3.24	131	3.48	216	3.80	110e	3.85	40e
28.....	3.53	241	3.34	166	3.24	127	3.47	212	3.90	110e	3.85	40e
29.....	3.53	241	3.32	158	3.23	120	3.43	196	4.00	110e	.....	40e
30.....	3.62	280	3.31	155	3.27	131	3.42	192	4.30	110e	3.80	40e
31.....	3.76	346	3.30	151	.....	.....	3.37	173	.....	.....	3.85	40e

e Discharge estimated.

x Gauge heights March 29 to October 31 from automatic gauge.

MONTHLY DISCHARGE of Milk river at Spencer's lower ranch, for 1916

(Drainage area 2,514 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	.....	.....	18	0.007	0.01	1,107
February.....	.....	.....	1,130	0.449	0.48	65,000
March.....	.....	.....	730	0.290	0.33	44,886
April.....	503	245	384	0.153	0.17	22,850
May.....	1,160	204	439	0.175	0.20	26,993
June.....	1,130	415	766	0.305	0.34	45,580
July.....	3,500	208	678	0.270	0.31	41,689
August.....	553	148	262	0.104	0.12	16,110
September.....	973	120	264	0.105	0.12	15,709
October.....	285	120	212	0.084	0.10	13,035
November.....	.....	.....	136	0.054	0.06	8,093
December.....	.....	.....	72	0.029	0.03	4,427
The year.....	.....	.....	.....	.....	2.27	305,479

Discharge for the months January, February, March, November and December, estimated by comparison with discharge of Milk river at Milk River and Havre.

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE of Milk river at Spencer's lower ranch

Area of watershed 2,404 and 2,515 square miles
Average run-off per square mile 60 acre-feet

YEAR	Jan. Sec.-ft.	Feb. Sec.-ft.	Mar. Sec.-ft.	April Sec.-ft.	May Sec.-ft.	June Sec.-ft.	July Sec.-ft.	Aug. Sec.-ft.	Sept. Sec.-ft.	Oct. Sec.-ft.	Nov. Sec.-ft.	Dec. Sec.-ft.	Total Acre-ft.
1909.								131b	74	73	85a	.....	14,856a
1910.				219a	185	108	27	5	44	42	.....	.....	32,310
1911.			433b	285	363	348	230	116	422	200	168a	.....	134,753
1912.				580b	318	136	113	60	60	78	77a	.....	77,869
1913.			340a	944	530	320	180	85	32	66	81	37	137,037
1914.				121b	501	158	103	26	7	23	168	65	20 71,917
1915.				297b	300	224	550	321	204	196	193	115	42 147,796
1916.	18d	1,130c		730d	384	439	766	262	264	212	136d	72d	305,479
Average Sec.-ft. .	18d	226c	395	499	317	333	225	109	139	129	99	42	129,595
Average Acre-ft. .	1,107	12,551	24,288	29,693	19,492	19,815	13,835	6,702	8,271	7,932	5,891	2,582	152,159

a Records incomplete; not included in average.

b Reduced to monthly averages.

c Estimated and averaged for 5 years as abnormal conditions.

d Estimated.

PAKOWKI LAKE DRAINAGE BASIN

General Description

Pakowki lake received most of the drainage of the Western slope of the Cypress hills, and a small amount of water from the northern slope of the Milk River ridge. It also received, via Etzikom coulee, a certain amount of tail-water from the Alberta Railway Irrigation Company's canals. There is no outlet to this lake, the water level being about 30 feet lower than that of Milk river in Range 8, West of the 4th Meridian.

The streams within this drainage basin are very similar in their general characteristics, all having narrow, deep, and well defined valleys, with a growth of willows along the bottoms. Most of these creeks on the east side of the lake have considerable flats and meadows, covered with native grasses and sage brush, and are to a great extent irrigated from these creeks. During heavy rainfall these creeks are subject to rapid rises and correspondingly rapid falls of stage. Canal creek and the south branch of Manyberries creek drain a considerable part of broken land, devoid of tilth, and the run-off from these creeks, contributed by deep coulees where the subsoil is exposed, is comparatively large, almost all the precipitation finding its way into the creek channels.

There are several irrigation works situated on Manyberries, Ketchum and Canal creeks, all the water coming down from the higher ground, except during a very large run-off, being used in irrigating the lower flats, very little water being discharged into Pakowki lake.

The yield of cultivated hays of different kinds, native hay and alfalfa, has been considerably increased by the use of these waters.

ETZIKOM COULEE NEAR STIRLING

Location.—On SW. $\frac{1}{4}$ Sec. 3, Tp. 7, Rge. 19, W. 4th Mer., at highway bridge, one and one-half miles northeast of Stirling.

Records available.—May 1, 1914, to October 31, 1916.

Drainage area.—The flow in this coulee is partly from its drainage area, but largely from over-flow of the Alberta Railway and Irrigation Company's irrigation ditch.

Gauge.—Vertical staff fastened to bridge pile on downstream side against north abutment; zero maintained at elevation 92.83 feet since establishment.

Bench-mark.—Permanent iron bench-mark, located 25 feet east of south end of bridge; assumed elevation 100.00 feet.

Channel.—Composed of clay and liable to be affected by the growth of weeds in bed.

Discharge measurements.—At ordinary stages measurements are made with current-meter by wading. At low water stage with a weir, and at extreme high water with current-meter from the traffic bridge.

Observer.—Wm. Christensen.

DISCHARGE MEASUREMENTS of Etzikom coulee near Stirling, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 22.....	S. H. Frame.....	16.5	26.00	1.90	3.27	50.0
April 12.....	do	10.5	10.00	0.64	1.91	6.4
May 10.....	do	10.5	9.90	0.80	1.92	7.9
May 29.....	do	20.0	33.00	1.79	3.48	59.0
May 29.....	do	83.0	15.20	1.36	.....	206.0 _x
July 20.....	do	12.0	18.00	0.94	2.68	17.0
Aug. 10.....	do	15.0	27.40	1.43	3.15	39.0
Aug. 31.....	do	11.0	10.80	0.71	2.05	7.7
Sept. 21.....	do	12.5	20.10	1.12	2.72	23.0
Oct. 12.....	do	11.5	18.80	1.23	2.61	23.0

_x Slope measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Etzikom coulee near Stirling, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			2.21	10.80	1.26	1.95	2.45	15.0
2.....			2.19	10.50	1.25	1.90	4.20	111.0
3.....			2.22	11.00	1.25	1.90	3.30	49.0
4.....			2.22	11.00	1.26	1.95	2.95	30.0
5.....			2.21	10.80	2.07	8.90	2.80	24.0
6.....			2.21	10.80	2.09	9.10	2.64	19.3
7.....			2.20	10.60	2.07	8.90	3.30	49.0
8.....			2.19	10.50	2.09	9.10	2.70	21.0
9.....			2.17	10.20	2.09	9.10	2.90	28.0
10.....			2.14	9.80	1.90	6.80	3.09	37.0
11.....			2.10	9.20	1.95	7.40	3.10	38.0
12.....	4.83	156.0	2.00	8.00	1.85	6.40	3.12	39.0
13.....	4.83	156.0	2.00	8.00	1.80	5.80	3.16	41.0
14.....	3.84	86.0	1.30	2.20	1.75	5.40	2.60	18.3
15.....	3.15	40.0	1.18	1.55	1.70	5.00	2.35	13.0
16.....	3.75	80.0	1.17	1.50	1.70	5.00	2.34	12.9
17.....	3.44	58.0	1.16	1.45	1.70	5.00	2.24	11.2
18.....	3.20	43.0	1.16	1.45	1.70	5.00	2.19	10.5
19.....	3.15	40.0	1.14	1.36	1.68	4.80	2.14	9.8
20.....	3.09	37.0	1.16	1.45	1.66	4.70	2.14	9.8
21.....	3.18	42.0	1.18	1.55	1.66	4.70	2.15	10.0
22.....	3.09	37.0	1.20	1.65	1.75	5.40	2.17	10.2
23.....	3.06	36.0	1.21	1.70	2.65	19.60	2.18	10.4
24.....	3.05	35.0	1.22	1.75	1.85	6.40	2.20	10.6
25.....	3.04	34.0	1.22	1.75	2.00	8.00	2.20	10.6
26.....	3.25	46.0	1.25	1.90	2.70	21.00	2.50	16.0
27.....	3.21	44.0	1.26	1.95	3.45	59.00	2.55	17.1
28.....	3.15	40.0	1.26	1.95	3.65	73.00	3.00	32.0
29.....	3.18	42.0	1.26	1.95	3.45	59.00	3.25	46.0
30.....	2.65	19.6	1.26	1.95	3.05	35.00	3.45	59.0
31.....	2.23	11.1	.....	.....	2.50	16.00	.....	.....

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Etzikom coulee near Stirling, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	4.00	97.0	2.45	15.0	1.85	6.4	2.45	15.0
2.....	3.80	83.0	2.40	14.0	1.84	6.2	2.48	15.6
3.....	3.55	66.0	2.32	12.5	3.20	43.0	2.52	16.4
4.....	3.25	46.0	2.20	10.6	4.15	108.0	2.54	16.9
5.....	3.14	40.0	2.15	10.0	5.12	176.0	2.54	16.9
6.....	3.00	32.0	2.06	8.7	5.60	209.0	2.54	16.9
7.....	2.90	28.0	1.92	7.1	4.90	160.0	2.55	17.1
8.....	2.73	22.0	1.85	6.4	4.20	111.0	2.59	18.1
9.....	2.70	21.0	2.95	30.0	3.85	87.0	2.65	19.6
10.....	2.70	21.0	3.05	35.0	3.60	69.0	2.70	21.0
11.....	2.70	21.0	3.10	38.0	3.52	64.0	2.70	21.0
12.....	2.75	22.0	3.10	38.0	3.40	56.0	2.61	18.6
13.....	2.70	21.0	3.05	35.0	3.30	49.0	2.65	19.6
14.....	2.55	17.1	3.00	32.0	3.25	46.0	2.65	19.6
15.....	2.51	16.2	2.94	30.0	3.05	35.0	2.64	19.3
16.....	2.54	16.9	2.88	27.0	3.05	35.0	2.64	19.3
17.....	2.55	17.1	2.80	24.0	3.03	34.0	2.60	18.3
18.....	3.05	35.0	2.76	23.0	3.00	32.0	2.55	17.1
19.....	2.90	28.0	2.60	18.3	3.00	32.0	2.52	16.4
20.....	2.68	20.0	2.45	15.0	2.95	30.0	2.49	15.8
21.....	2.60	18.3	2.39	13.8	2.72	22.0	2.46	15.2
22.....	2.61	18.6	2.35	13.0	2.75	22.0	2.45	15.0
23.....	2.60	18.3	2.29	12.0	2.78	24.0	2.46	15.2
24.....	2.58	17.8	2.25	11.4	2.64	19.3	2.45	15.0
25.....	2.58	17.8	2.21	10.8	2.58	17.8	2.45	15.0
26.....	2.54	16.9	2.18	10.4	2.50	16.0	2.42	14.4
27.....	2.54	16.9	2.16	10.1	2.49	15.8	2.40	14.0
28.....	2.52	16.4	2.15	10.0	2.46	15.2	2.40	14.0
29.....	2.54	16.9	2.07	8.9	2.45	15.0	2.39	13.8
30.....	2.52	16.4	1.98	7.8	2.42	14.4	2.37	13.4
31.....	2.48	15.6	1.87	6.6	.....	.....	2.35	13.0

MONTHLY DISCHARGE of Etzikom coulee near Stirling, for 1916

(Drainage area 203 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (12-31).....	156.0	11.10	54.0	0.266	0.20	2,142
April.....	11.0	1.36	5.3	0.026	0.03	315
May.....	73.0	1.90	13.6	0.067	0.08	836
June.....	111.0	9.80	27.0	0.133	0.15	1,607
July.....	97.0	15.60	28.0	0.138	0.16	1,722
August.....	38.0	6.40	17.6	0.086	0.10	1,082
September.....	209.0	6.20	52.0	0.256	0.28	3,094
October.....	21.0	13.00	16.7	0.082	0.10	1,027
The period.....					1.10	11,825

ETZIKOM COULEE NEAR GODDARD

Location.—On SW. $\frac{1}{4}$ Sec. 2, Tp. 5, Rge. 13, W. 4th Mer., near outlet of Crow Indian lake.
Records available.—May 28, 1915, to October 31, 1915.
Gauge.—Vertical staff maintained at zero elevation of 96.31 feet since establishment.
Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.
Channel.—Gravel and sand, not liable to change.
Discharge measurements.—Made by wading.
Observer.—Wm. Rutherford.
Remarks.—Vegetation growing in channel, and winds likely to affect the records.

DISCHARGE MEASUREMENTS of Etzikom coulee near Goddard, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 21.....	S. H. Frame.....	83.0	63.00	1.88	2.26	118.0
April 11.....	do.....	18.0	16.00	1.37	1.34	22.0
May 9.....	do.....	14.5	12.20	0.61	0.82	7.5
July 18.....	do.....	27.0	19.60	0.80	1.42	15.7
Aug. 8.....	do.....	14.0	9.30	0.62	0.92	5.8
Aug. 29.....	do.....	27.0	17.80	0.90	1.33	16.0
Sept. 19.....	do.....	75.0	50.20	1.19	1.99	60.0
Oct. 10.....	do.....	15.0	18.30	1.73	1.52	32.0

DAILY GAUGE HEIGHT AND DISCHARGE of Etzikom coulee near Goddard, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....				36.0e		5.70e		7.6e
2.....			1.52	32.0	0.65	5.00		9.0e
3.....				28.0e	1.10	13.60	1.06	10.3
4.....			1.38	24.0	0.90	8.80	1.06	10.3
5.....				32.0e		5.90e	1.26	16.2
6.....			1.63	40.0	0.45	3.00	1.26	16.2
7.....				40.0e	0.85	7.90	1.26	16.2
8.....				40.0e	0.50	3.40		18.5e
9.....			1.63	40.0		3.20		21.0e
10.....				31.0e	0.45	2.90e	1.46	23.0
11.....			1.35	22.0		2.60e	1.66	35.0
12.....			1.35	22.0	0.36	2.20		27.0e
13.....	2.26	118		21.0e		1.99e	1.36	19.0
14.....	2.26	118		19.6e	0.30	1.78	1.31	17.2
15.....		114e	1.25	18.4	0.39	2.30	1.31	17.2
16.....	2.21	110	1.15	15.1	0.30	1.72		16.2e
17.....		110e	1.10	13.6	0.25	1.42		15.2e
18.....		110e		12.9e		1.50e	1.26	14.2
19.....	2.21	110	1.05	12.2		1.58e	1.21	12.8
20.....		100e	1.15	15.1	0.30	1.66	1.06	9.0
21.....		90e		12.8e	0.30	1.66		12.5e
22.....	2.01	81	0.98	10.5		1.54e	1.31	16.0
23.....		77e	0.90	8.8		1.42e	1.31	16.0
24.....		72e	0.75	6.4	0.25	1.30		14.8e
25.....	1.91	68		6.0e	0.50	3.00	1.26	13.6
26.....	1.91	68	0.70	5.7		3.20e		13.6e
27.....		68e	0.75	6.4	0.55	3.30		13.6e
28.....	1.92	69		6.4e	0.45	2.40	1.26	13.6
29.....		56e	0.75	6.4	0.56	3.30		15.8e
30.....	1.67	43	0.75	6.4	0.70	4.80	1.36	17.0
31.....		40e				6.20e		

e Discharge estimated.
s Shifting conditions, May 10 to Aug. 7

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Etzikom coulee near Goddard, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1		16.0e		8.0		14.3e	1.57	27s
2		15.1e		7.7	1.26	13.6	1.50	27
3	1.31	14.2		7.5		18.8e		34e
4		14.0e		7.2	1.51	24.0	1.65	41s
5		13.8e		6.9		28.0e	1.65	41
6		13.6e	0.96	6.6		32.0e		39e
7	1.31	13.4		6.2se		36.0e		36e
8		14.9e	0.92	5.7		40.0e	1.55	34
9	1.41	16.4		5.9e		44.0e	1.54	33
10		16.3e		6.1e		49.0e	1.52	32
11		16.2e		6.2e		53.0e	1.52	32
12		16.1e		6.4e		57.0e		30e
13		16.0e	0.97	6.6		61.0e		29e
14		15.9e		7.9e		65.0e	1.46	28
15		15.8e		9.2e		69.0e	1.45	28
16	1.41	15.7		10.5e	2.11	73.0		28e
17		15.7e		11.8e	2.11	73.0	1.45	28
18	1.42	15.7		13.1e		69.0e		28e
19		15.5e		14.4e		64.0e	1.45	28
20		15.3e	1.32	15.7		60.0e		28e
21		15.0e		15.7e		55.0e	1.45	28
22		14.8e		15.7e		51.0e	1.45	28
23	1.32	14.6		15.7e	1.85	47.0		28e
24		15.7e		15.7e	1.80	43.0	1.45	28
25		13.9e		15.7e	1.78	42.0		28e
26		13.0e		15.7e	1.90	52.0	1.45	28
27		12.2e	1.32	15.7		46.0e		28e
28		11.3e		15.9e	1.75	39.0	1.45	28
29		9.5e	1.33	16.1		38.0e	1.50	31
30	1.12	8.6		15.5e	1.70	36.0	1.50	31
31		8.3e	1.30	15.0				31e

e Discharge estimated.

s Shifting conditions, May 10 to Aug. 7; Oct. 1 to Oct. 4.

MONTHLY DISCHARGE of Etzikom coulee near Goddard, for 1916

(Drainage area 714 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (13-31)	118.0	40.0	85.0	0.119	0.08	3,203
April	40.0	5.7	19.7	0.028	0.03	1,172
May	13.6	1.3	3.6	0.005	0.01	221
June	35.0	7.6	15.9	0.022	0.24	946
July	16.4	8.3	14.3	0.020	0.02	879
August	16.1	5.7	11.0	0.015	0.02	676
September	73.0	13.6	46.0	0.064	0.07	2,737
October	41.0	27.0	31.0	0.043	0.05	1,906
The period					0.52	11,740

IRRIGATION CREEK AT JACQUES' RANCH

Location.—On the SE. $\frac{1}{4}$ Sec. 35, Tp. 5, Rge. 7, W. 4th Mer., at Chas. Jacques' ranch near Orion, Alberta.

Records available.—March 21 to October 31, 1916.

Gauges.—A temporary gauge was maintained from March 21 to May 18 at a section about one-quarter mile above present gauge; zero of present gauge is 94.30 feet.

Bench-mark.—Permanent iron bench-mark, located 780 feet from north quarter-section line and 750 feet from east quarter-section line; assumed elevation 100.00 feet.

Discharge measurements.—Made with current-meter by wading or from temporary cable car, or with a weir depending on stage of creek.

Observer.—Chas. Jacques.

DISCHARGE MEASUREMENTS of Irrigation creek at Jacques' ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 18.....	L J Gleeson.....	12.5	8.34	0.75	.....	6.30
Mar. 21.....	do.....	22.8	30.60	0.76	1.80z	23.00
Mar. 28.....	do.....	3.3	1.55	0.19	0.85x	0.80
April 9.....	do.....	.....	.....	.....	0.72x	Nil
May 6.....	H W Rowley.....	.....	.....	.....	.....	Nil
May 18.....	do.....	.....	.....	.....	.....	Nil
June 15.....	do.....	7.0	2.60	1.42	1.46	3.70
July 11.....	do.....	.....	.....	.....	1.42	2.90w
Aug. 2.....	do.....	.....	.....	.....	.....	Nil
Aug. 21.....	do.....	.....	.....	.....	0.34	Nil
Sept. 15.....	do.....	.....	.....	.....	.....	Nil
Oct. 5.....	do.....	.....	.....	.....	.....	Nil

x Temporary station.

w Discharge determined by using a 36-inch weir.

DAILY GAUGE HEIGHT AND DISCHARGE of Irrigation creek at Jacques' ranch, for 1916

DAY	March		April		May		June	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	.....	.....	0.90	1.40	.....	Nil	1.30	1.20
2.....	.....	.....	0.70	Nil	.....	.....	1.13	0.48
3.....	.....	.....	0.70	"	.....	"	1.00	0.20
4.....	.....	.....	0.70	"	.....	"	0.98	0.18
5.....	.....	.....	.....	"	.....	"	0.98	0.18
6.....	.....	.....	.....	"	.....	"	0.96	0.15
7.....	.....	.....	.....	"	.....	"	0.96	0.15
8.....	.....	.....	.....	"	.....	"	0.96	0.15
9.....	.....	.....	.....	"	.....	"	0.96	0.15
10.....	.....	.....	.....	"	.....	"	2.04	16.50
11.....	.....	.....	.....	"	.....	"	3.50	54.00
12.....	.....	.....	.....	"	.....	"	2.90	38.00
13.....	.....	.....	.....	"	.....	"	2.00	15.50
14.....	.....	.....	.....	"	.....	"	1.50	4.50
15.....	.....	.....	.....	"	.....	"	1.40	2.60
16.....	.....	.....	.....	"	.....	"	1.30	1.20
17.....	.....	.....	.....	"	.....	"	1.30	1.20
18.....	.....	.....	.....	"	.....	"	1.25	0.92
19.....	.....	.....	.....	"	.....	"	1.23	0.83
20.....	.....	.....	.....	"	.....	"	1.15	0.53
21.....	1.80	23.00	.....	"	.....	"	1.12	0.45
22.....	1.60	18.00	.....	"	.....	"	1.04	0.27
23.....	1.50	15.40	.....	"	.....	"	1.04	0.27
24.....	1.50	15.40	.....	"	.....	"	1.04	0.27
25.....	1.40	12.80	.....	"	.....	"	1.04	0.27
26.....	1.20	7.80	.....	"	.....	"	1.04	0.27
27.....	0.90	1.40	.....	"	.....	"	1.04	0.27
28.....	0.90	1.40	.....	"	.....	"	1.02	0.24
29.....	0.90	1.40	.....	"	0.65	"	1.90	13.10
30.....	0.80	0.50	.....	"	0.80	0.05	1.90	13.10
31.....	0.80	0.50	.....	"	1.70	8.60	.....	.....

x Permanent station gauge rod used after May 18.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Irrigation creek at Jacques' ranch, for 1916.—*Concluded.*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	1.65	7.50	0.92	0.12	.....	Nil	.....	Nil
2	1.62	6.90	0.85	0.07	.....	.....	.....	.....
3	1.50	4.50	0.76	0.03	.....	.....	.....	.....
4	2.08	17.40	0.71	0.01	.....	.....	.....	.....
5	1.68	8.20	0.65	Nil	.....	.....	.....	.....
6	1.50	4.50	.....	.....	.....	.....	.....	.....
7	1.47	3.90	.....	.....	.....	.....	.....	.....
8	1.75	9.70	.....	.....	.....	.....	.....	.....
9	1.60	6.50	.....	.....	.....	.....	.....	.....
10	1.50	4.50	.....	.....	.....	.....	.....	.....
11	1.42	3.00	.....	.....	.....	.....	.....	.....
12	1.18	0.63	.....	.....	.....	.....	.....	.....
13	1.04	0.27	.....	.....	.....	.....	.....	.....
14	1.00	0.20	.....	.....	.....	.....	.....	.....
15	0.96	0.15	.....	.....	.....	.....	.....	.....
16	0.92	0.12	.....	.....	.....	.....	.....	.....
17	0.84	0.07	.....	.....	.....	.....	.....	.....
18	0.84	0.07	.....	.....	.....	.....	.....	.....
19	0.90	0.10	.....	.....	.....	.....	.....	.....
20	0.90	0.10	.....	.....	.....	.....	.....	.....
21	0.84	0.07	0.34	.....^d	.....	.....	.....	.....
22	0.77	0.04 ^d	.....	.....	.....	.....	.....	.....
23	0.77	0.04	.....	.....	.....	.....	.....	.....
24	0.75	0.03	.....	.....	.....	.....	.....	.....
25	0.67	Nil	.....	.....	.....	.....	.....	.....
26	0.65	.....	.....	.....	.....	.....	.....	.....
27	1.53	5.10	.....	.....	.....	.....	.....	.....
28	1.25	0.92	.....	.....	.....	.....	.....	.....
29	1.02	0.24	.....	.....	.....	.....	.....	.....
30	1.02	0.24	.....	.....	.....	.....	.....	.....
31	0.97	0.16	.....	.....	.....	.....	.....	.....

^d Actual measurement.

MONTHLY DISCHARGE of Irrigation creek at Jacques' ranch, for 1916

(Drainage area 85 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (21-31)	23.00	0.50	8.90	0.105	0.04	194
April	1.40	Nil	0.04	0.000	0.00	2
May	8.60	.....	0.28	0.003	0.00	17
June	54.00	0.15	5.60	0.066	0.07	333
July	17.40	Nil	2.70	0.032	0.04	166
August	0.12	.....	0.01	0.000	0.00	0
September	Nil	.....	Nil	0.000	0.00	0
October	.....	.....	.....	0.000	0.00	0
The period	.....	.....	.....	.....	0.15	712

HOOPER AND HUCKVALE NORTH DITCH FROM MANYBERRIES CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 27, Tp. 4, Rge. 6, W. 4th Mer.
Records available.—From May 2, 1912, to October 9, 1916.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Discharge measurements.—Made with current-meter by wading.

Observer.—Sidney Hooper.

Gauge.—Vertical staff; zero elevation maintained at 93.35 feet since establishment.

DISCHARGE MEASUREMENTS of Hooper and Huckvale North ditch from Manyberries creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 16.	L. J. Gleeson.	9.3	8.45	0.86	2.53	7.30
Mar. 22.	do	10.2	18.60	1.24	3.04	23.00
Mar. 22.	do	9.9	15.80	1.06	2.86	16.90
Mar. 29.	do	10.9	16.60	0.85	2.75	14.00
April 4.	do	10.5	14.60	0.56	2.54	8.10
April 10.	do	9.3	8.95	0.58	2.38	5.30
May 5.	H. W. Rowley				1.74	0.36 ^w
May 18.	do				1.51	Nil
June 14.	do	10.0	8.80	1.32	2.65	11.60
July 10.	do	6.0	2.60	0.83	2.14	2.20
July 31.	do	6.0	2.50	0.78	2.09	1.96
Aug. 19.	do				1.94	1.61 ^w
Sept. 14.	do				1.89	1.87
Oct. 6.	do				1.64	Nil

^w Discharge determined by using a weir.

DAILY GAUGE HEIGHT AND DISCHARGE of Hooper and Huckvale North ditch from Manyberries creek, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.			2.27	4.1	2.60	9.90	1.84	0.80	2.70	12.4
2.			2.30	4.5	2.64	10.90	1.84	0.80	2.79	15.0
3.			2.26	4.0	2.62	10.40	1.80	0.62	2.66	11.4
4.			2.17	3.1	2.54	8.60	1.78	0.54	2.52	8.1
5.			2.34	5.1	2.45	6.80	1.76	0.46	2.41	6.2
6.			2.22	3.6	2.36	5.40	1.74	0.38	2.44	6.6
7.				6.0 ^e	2.28	4.30	1.72	0.30	2.62	10.4
8.				8.0 ^e	2.30	4.50	1.72	0.30	2.53	8.2
9.				10.0 ^e	2.34	5.10	1.71	0.26	2.30	4.5
10.			2.87	17.4	2.43	6.50	1.69	0.19	2.38	5.7
11.			3.81	49.0	2.69	12.10	1.68	0.15	3.19	3.3
12.			3.87	51.0		9.90 ^e	1.64	0.04	2.65	11.1
13.			3.35	34.0	2.50	7.70	1.62	0.02	2.48	7.3
14.			2.84	16.5	2.39	5.80	1.59	Nil	2.63	10.6
15.			2.38	5.7	2.40	6.00		"	2.57	9.2
16.			2.67	11.6		5.50 ^e		"		8.0 ^e
17.			2.67	11.6	2.34	5.10		"		6.0 ^e
18.			2.74	13.5	2.23	3.70		"	2.25	3.9
19.			2.43	6.5	2.18	3.20		"	2.26	4.0
20.	2.57	9.2	2.99	21.0	2.12	2.60		"	3.05	23.0
21.	2.73	13.2	3.32	32.0	2.08	2.20		"	2.55	8.8
22.	2.46	7.0	3.12	26.0	2.06	2.10		"	2.24	3.8
23.	2.11	2.5	3.07	24.0	2.01	1.76		"	2.36	5.4
24.		2.4	3.09	25.0	1.96	1.44		"	2.30	4.5
25.	2.75	13.8	2.97	21.0	1.94	1.32		"	2.32	4.8
26.	2.62	10.4	2.72	13.0	1.91	1.16		"	2.34	5.1
27.		8.8 ^e	3.06	24.0	1.89	1.05	2.26	4.00	2.43	6.5
28.	2.47	7.2	2.90	18.4	1.85	0.85	2.37	5.50	2.50	7.7
29.	2.27	4.1	2.77	14.4	1.84	0.80	2.51	7.90	2.45	6.8
30.			2.72	13.0	1.84	0.80	3.15	27.00	2.43	6.5
31.			2.60	9.9			2.88	17.80		

^e Discharge estimated.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Hooper and Huckvale North ditch from Manyberries creek, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	2.39	5.80	2.05	2.00		Nil		1.60e
2	2.21	3.50	2.01	1.80		"		1.80e
3	2.51	7.90	1.98	1.57		"		2.00e
4	2.83	16.20	1.96	1.44	3.48	38.00		2.20e
5	2.63	10.60	1.94	1.32	3.12	26.00		2.40e
6	2.53	8.20	1.91	1.16	2.54	8.60		2.50e
7		6.80e		1.16e	2.28	4.30		2.60e
8	2.37	5.50	1.91	1.16	2.23	3.70	2.12	2.60
9	2.16	3.00	1.93	1.27		3.50	2.09	2.30
10	2.14	2.80	2.06	2.10	2.22	3.60		
11	2.14	2.80	2.11	2.50	2.13	2.70		
12	2.11	2.50	1.98	1.57	2.01	1.76		
13	2.12	2.60	1.84	0.80		1.48e		
14	2.12	2.60	1.81	0.67	1.92	1.21		
15	2.08	2.20	1.76	0.46	1.88	1.00		
16	1.92	1.21	1.71	0.26	1.86	0.90		
17	1.88	1.00	1.66	0.08	1.83	0.76		
18	2.73	13.20	1.70	0.22		0.76e		
19	2.41	6.20	1.67	0.12		0.76e		
20	2.18	3.20	1.98	1.57		0.90e		
21	2.16	3.00	1.81	0.67		1.10e		
22	2.16	3.00	1.75	0.42		1.10e		
23	2.14	2.80	1.64	0.04		1.15e		
24	2.12	2.60	1.58	Nil		1.20e		
25	2.11	2.50	1.53	Nil		1.25e		
26	2.40	6.00	1.52	"		1.30e		
27	2.21	3.50	1.48	"		1.35e		
28	2.17	3.10		"		1.40e		
29	2.16	3.00		"		1.45e		
30	2.13	2.70		"		1.50e		
31	2.09	2.30		"				

e Discharge estimated.

MONTHLY DISCHARGE of Hooper and Huckvale North ditch from Manyberries creek, for 1916

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (20-29)	13.8	2.40	7.90			157
March	51.0	3.10	16.30			1,002
April	12.1	0.80	4.90			292
May	27.0	Nil	2.20			135
June	23.0	3.30	7.80			464
July	16.2	1.00	4.60			283
August	2.5	Nil	0.79			49
September	38.0	"	3.80			226
October (1-9)	2.6	1.60	2.20			39
The period						2,647

MANYBERRIES CREEK AT HOOPER AND HUCKVALE'S RANCH

Location.—On the SW. $\frac{1}{4}$ Sec. 27, Tp. 4, Rge. 6, W. 4th Mer.

Records available.—April 1, 1911, to September 30, 1916.

Gauge.—Vertical staff; zero maintained at elevation 87.00 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—The stream flows in one channel except in very high stages; bed consists of sand, clay and gravel.

Discharge measurements.—With current-meter; at low stages made by wading, at high stages a portable cable and cable car is used.

Diversions.—Hooper and Huckvale's north ditch diverts water about one-half mile above this station and the south ditch about one-half mile below.

Observer.—Sidney Hooper.

Remarks.—Creek still flowing after September 30, but no gauge height records obtained except for October 8 and 9.

DISCHARGE MEASUREMENTS of Manyberries creek at Hooper and Huckvale's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 15	L. J. Gleeson	24.3	16.3	1.16	3.81	19.00
Mar. 16	do	31.0	53.9	1.14	4.85	62.00
Mar. 20	do	44.2	91.22	1.95	5.75	178.00
Mar. 27	do	46.2	98.93	1.64	5.67	160.00
Mar. 29	do	10.1	7.0	1.83	2.76	12.80
April 4	do	5.1	0.98	0.61	1.83	0.60
April 5	do				1.74	0.112 ^w
April 7	do				1.67	0.046 ^w
April 10	do				1.71	0.076 ^w
May 5	H. W. Rowley				1.68	0.05 ^w
May 18	do				1.68	Nil
June 14	do	11.0	4.8	1.84	2.82	8.80
July 10	do	6.0	2.5	1.64	2.16	4.10
July 31	do	5.0	1.7	1.65	1.97	2.80
Aug. 19	do				1.72	Nil
Sept. 14	do				1.66	Nil
Oct. 6	do				1.66	Nil

^w Discharge measured with 15-inch weir on April 5, 7 and 10; with 6-inch weir on May 5.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Manyberries creek at Hooper and Huckvale's ranch,
for 1916

DAY	February		March		April		May	
	Gauge Height	Dis- charge	Gauge Height	Dis- charge	Gauge Height	Dis- charge	Gauge Height	Dis- charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			2.68		2.03	3.10	1.67	0.35
2.....			2.50		2.07	3.50	1.67	0.35
3.....			2.22		2.00	2.80	1.67	0.35
4.....					2.88	15.10	1.67	0.35
5.....					1.73	0.65	1.67	0.35
6.....					1.70	0.50	1.67	0.35
7.....					1.69	0.45	1.67	0.35
8.....					1.70	0.50	1.67	0.35
9.....					1.70	0.50	1.67	0.35
10.....			5.67		1.71	0.55	1.67	0.35
11.....			10.63		2.08	3.60	1.67	0.35
12.....			10.92			2.20 ^e	1.67	0.35
13.....			9.84 ^x		1.75	0.75	1.67	0.35
14.....					1.69	0.45	1.67	0.35
15.....			2.50	13.00	1.67	0.35	1.67	0.35
16.....			4.56	51.00		0.40 ^e	1.67	0.35
17.....			4.39	50.00	1.69	0.45	1.67	0.35
18.....			4.51	57.00	1.70	0.50	1.67	0.35
19.....			4.01	42.00	1.70	0.50	1.66	0.30
20.....		3.95 ^x	6.89	445.00	1.71	0.55	1.66	0.30
21.....	4.34		6.95	459.00	1.66	0.30	1.66	0.30
22.....	4.70		5.52	134.00	1.66	0.30	1.66	0.30
23.....	5.05		5.64	156.00	1.67	0.35	1.66	0.30
24.....	4.33		3.09	19.50	1.69	0.45	1.66	0.30
25.....	3.66		3.08	19.30	1.68	0.40	1.66	0.30
26.....	3.59		2.57	9.80	1.68	0.40	1.66	0.30
27.....			5.56	141.00	1.68	0.40	3.03	8.20
28.....	3.51		3.61	32.00	1.68	0.40	2.29	6.00
29.....	3.95		2.66	11.30	1.67	0.35	1.93	2.10
30.....			2.37	7.00	1.67	0.35	7.33	548.00
31.....			2.20	4.90			4.43	58.00

^x Gauge heights February 20 to March 13 affected by snow; not reliable^e Discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Manyberries creek at Hooper and Huckvale's ranch,
for 1916—*Concluded*

DAY	June		July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	2.41	7.50	2.05	2.20	1.70	0.50	1.70	0.50	.....	.....
2.....	2.85	14.60	1.95	1.40	1.70	0.50	1.70	0.50	.....	.....
3.....	2.33	6.50	3.85	36.00	1.70	0.50	.....	328.00 ^e	.....	.....
4.....	1.91	1.90	6.80	403.00	1.70	0.50	7.80	659.00	.....	.....
5.....	1.83	1.24	3.33	23.00	1.69	0.45	5.78	185.00	.....	.....
6.....	1.82	1.16	2.45	7.50	1.69	0.45	3.01	17.80	.....	.....
7.....	2.26	5.60	.....	5.40 ^e	.....	0.45 ^e	2.30	6.10	.....	.....
8.....	1.87	1.56	2.10	3.40	1.69	0.45	1.96	2.40	2.22	5.1
9.....	2.77	13.20	2.40	7.40	1.70	0.50	.....	1.45 ^e	2.14	4.2
10.....	2.80	13.70	2.16	4.10	2.22	5.10	1.70	0.50	.....	.....
11.....	9.28	1,007.00	2.03	3.10	2.03	3.10	1.70	0.50	.....	.....
12.....	6.02	241.00	1.96	2.40	1.84	1.32	1.70	0.50	.....	.....
13.....	3.44	27.00	1.87	1.56	1.72	0.60	.....	0.50	.....	.....
14.....	2.71	7.00	1.81	1.08	1.70	0.50	1.70	0.50	.....	.....
15.....	2.48	4.50	1.72	0.60	1.70	0.50	1.68	0.40	.....	.....
16.....	.....	44.00	1.72	0.60	1.70	0.50	1.68	0.40	.....	.....
17.....	.....	43.50	1.75	0.75	1.70	0.50	1.67	0.35	.....	.....
18.....	2.30	3.00	7.48	584.00	1.70	0.50	1.66	0.30	.....	.....
19.....	2.33	3.50	6.62	382.00	.....	0.55 ^e	1.66	0.30	.....	.....
20.....	6.29	243.00	3.30	24.00	1.72	0.60	1.66	0.30	.....	.....
21.....	2.93	12.00	2.38	7.10	1.70	0.50	1.66	0.30	.....	.....
22.....	2.43	5.30	2.24	5.40	1.70	0.50	1.66	0.30	.....	.....
23.....	3.53	25.00	2.21	5.00	1.70	0.50	1.66	0.30	.....	.....
24.....	2.49	6.20	1.96	2.40	1.69	0.45	1.66	0.30	.....	.....
25.....	2.14	2.50	1.91	1.90	1.70	0.50	1.66	0.30	.....	.....
26.....	2.03	1.60	5.84	199.00	1.70	0.50	1.66	0.30	.....	.....
27.....	2.08	2.20	4.57	64.00	1.70	0.50	1.66	0.30	.....	.....
28.....	2.07	2.20	3.00	17.60	1.70	0.50	1.66	0.30	.....	.....
29.....	1.95	1.00	2.26	5.60	1.70	0.50	1.66	0.30	.....	.....
30.....	1.95	1.00	2.01	2.90	1.70	0.50	1.66	0.30	.....	.....
31.....	.....	.....	1.98	2.60	1.70	0.50	.....	.....	.....	.....

^e Discharge estimated.

MONTHLY DISCHARGE of Manyberries creek at Hooper and Huckvale's ranch for 1916

(Drainage area 142 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (15-31).....	459.00	4.90	97.00	0.683	0.43	3,276
April.....	15.10	0.35	1.37	0.010	0.01	82
May.....	548.00	0.30	21.00	0.148	0.17	1,291
June.....	1,007.00	1.00	56.00	0.394	0.44	3,332
July.....	584.00	0.60	58.00	0.409	0.47	3,566
August.....	5.10	0.45	0.76	0.005	0.01	47
September.....	328.00	0.30	40.00	0.282	0.31	2,380
October (8-9).....	5.10	4.20	4.60	0.032	0.00	18
The period.....	.....	.....	.....	.....	1.84	13,992

SESSIONAL PAPER No. 25a

HOOPER AND HUCKVALE SOUTH DITCH FROM MANYBERRIES CREEK

Location.—On the NE. $\frac{1}{4}$ Sec. 22, Tp. 4, Rge. 6, W. 4th Mer.

Records available.—March 31, 1914, to October 31, 1916.

Gauge.—Vertical staff; zero elevation maintained at 93.07 feet, since establishment.

Bench-mark.—4-inch x 4-inch post in headgate of ditch; assumed elevation 100.00 feet.

Discharge measurements.—Made with current-meter by wading.

Observer.—Sidney Hooper.

Remarks.—Dam washed out; ditch not used during 1916.

KETCHUM CREEK AT PICKETT'S RANCH

Location.—On the NE. $\frac{1}{4}$ Sec. 25, Tp. 4, Rge. 7, W. 4th Mer.

Records available.—May 17, 1915, to October 31, 1916.

Gauge.—Vertical staff; zero maintained at elevation 93.98 feet, since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Discharge measurements.—Made by wading.

Observer.—C. J. Pickett.

Remarks.—The 1916 rating table used to obtain daily discharges for 1915, which, owing to there being no discharge measurements during 1915, were not computed. These records are published herewith.

DISCHARGE MEASUREMENTS of Ketchum creek at Pickett's ranch, in 1915-16

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1915						
June 10	W. H. Storey				Dry	Nil
June 30	do				"	"
July 7	do				"	"
July 28	do				1.40	x
Aug. 16	do				Dry	Nil
Sept. 1	do				"	"
Sept. 22	do				"	"
Oct. 11	do				"	"
Oct. 23	do				"	"
1916						
Mar. 17	L. J. Gleeson	23.8	12.38	0.77	2.80	9.50
Mar. 20	do	24.4	14.24	0.74	2.78	10.60
Mar. 29	do	15.6	11.10	0.58	2.44	6.40
April 5	do	3.2	1.19	0.56	1.67	0.67
May 6	H. W. Rowley				0.92	Nil
May 18	do				0.70	"
June 14	do	8.5	5.83	0.63	2.10	3.70
July 10	do				2.60	0.20w
July 31	do				2.66	Nil
Aug. 19	do				2.06	"
Sept. 14	do				2.42	"
Oct. 5	do				2.15	"
Nov. 20	do					i

x Small trickle, too small to measure.

i Pools frozen.

w Discharge taken with 12-inch weir.

DAILY GAUGE HEIGHT AND DISCHARGE of Ketchum creek at Pickett's ranch, for 1915

DAY	May		June		July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			Dry	Nil	Dry	Nil	Dry	Nil	Dry	Nil	Dry	Nil
2.....			"	"	"	"	"	"	"	"	"	"
3.....			"	"	"	"	"	"	"	"	"	"
4.....			"	"	"	"	"	"	"	"	"	"
5.....			"	"	"	"	"	"	"	"	"	"
6.....			"	"	"	"	"	"	"	"	"	"
7.....			"	"	"	"	"	"	"	"	"	"
8.....			"	"	"	"	"	"	"	"	"	"
9.....			"	"	"	"	"	"	"	"	"	"
10.....			"	"	"	"	"	"	"	"	"	"
11.....			"	"	"	"	"	"	"	"	"	"
12.....			"	"	"	"	"	"	"	"	"	"
13.....			"	"	"	"	"	"	"	"	"	"
14.....			"	"	2.25	4.60	"	"	"	"	"	"
15.....			"	"	5.05	41.00	"	"	"	"	"	"
16.....			"	"	4.62	35.00	"	"	"	"	"	"
17.....			"	"	3.90	25.00	"	"	"	"	"	"
18.....	1.44	0.81 _x	"	"	3.28	16.20	"	"	"	"	"	"
19.....	1.35	0.56	"	"	3.55	20.00	2.55	7.20	"	"	"	"
20.....	1.35	0.56	"	"	2.44	6.20	4.32	31.00	"	"	"	"
21.....	Dry	Nil	"	"	2.15	4.00	2.82	10.10	"	"	"	"
22.....	"	"	"	"	1.90	2.60	3.50	19.30	"	"	"	"
23.....	"	"	"	"	1.80	2.00	2.90	11.10	"	"	"	"
24.....	"	"	"	"	1.60	1.26	2.40	5.80	"	"	"	"
25.....	"	"	"	"	1.58	1.20	1.90	2.60	"	"	"	"
26.....	"	"	"	"	1.50	0.98	1.72	1.68	"	"	"	"
27.....	"	"	"	"	1.43	0.78	1.65	1.42	"	"	"	"
28.....	"	"	"	"	1.40	0.70	1.62	1.32	"	"	"	"
29.....	"	"	"	"	Dry	Nil	1.51	1.01	"	"	"	"
30.....	"	"	"	"	"	"	1.45	0.84	"	"	"	"
31.....	"	"	"	"	"	"	1.40	0.70	"	"	"	"

_x Discharge rating table for 1916 used to compute daily discharge for May 17 to Oct. 31, 1915.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Ketchuin creek at Pickett's ranch, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			2.10	3.60	2.00	3.00	Dry	Nil	2.96	11.80
2.....			2.08	3.50	1.94	2.80	"	"	2.42	6.00
3.....			2.04	3.20	1.92	2.60	"	"	1.90	2.60
4.....			1.08	0.13	1.93	2.70	"	"	1.69	1.56
5.....			Dry	Nil	1.67	1.49	"	"	1.65	1.42
6.....			"	"	1.67	1.49	0.92	"	1.59	1.23
7.....			"	"	1.58	1.20	0.90	"	1.55	1.12
8.....			"	"	1.51	1.01	0.88	"	1.48	0.92
9.....			3.05	13.00	1.41	0.73	0.85	"	1.40	0.70
10.....			5.09	42.00	1.40	0.70	0.84	"	1.50	0.98
11.....			12.17	141.00	1.39	0.67	0.76	"	2.68	8.50
12.....			9.34	108.00	1.35	0.56	Dry	"	5.44	46.00
13.....			6.54	62.00	Dry	Nil	"	"	2.87	10.70
14.....			3.59	21.00	"	"	"	"	2.10	3.60s
15.....			3.05	13.00	"	"	"	"	2.10	3.50
16.....			3.09	13.60	"	"	"	"	1.70	1.40
17.....			2.80	9.90	"	"	"	"	1.60	0.95
18.....	2.04	3.2	2.07	3.40	"	"	0.70	"	1.53	0.65
19.....	3.04	12.9	2.59	7.60	"	"	Dry	"	1.40	0.25
20.....	3.06	13.1	2.78	9.70	"	"	"	"	3.28	12.90
21.....	4.04	27.0	3.63	21.00	"	"	"	"	4.78	33.00
22.....	4.08	27.0	3.82	24.00	"	"	"	"	2.63	5.00
23.....	5.04	41.0	2.95	11.70	"	"	"	"	2.76	6.60
24.....	5.06	41.0	2.74	9.20	"	"	1.15	0.22	3.27	10.40
25.....	4.12	28.0	2.49	6.60	"	"	1.16	0.24	2.36	2.50
26.....	3.07	13.3	2.49	6.60	"	"	1.70	1.60	2.05	1.10
27.....	3.04	12.9	2.03	3.20	"	"	2.05	3.30	1.85	0.45
28.....	3.08	13.4	2.99	12.20	"	"	2.34	5.30	1.75	0.10
29.....	2.13	3.8	2.04	3.20	"	"	1.98	3.00	1.68	Nil
30.....			2.33	5.20	"	"	3.70	22.00	1.64	"
31.....			2.00	3.00			4.68	36.00		

s Shifting conditions, June 14 to Oct. 31.

DAILY GAUGE HEIGHT AND DISCHARGE of Ketchum creek at Pickett's ranch, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	1.68	Nil	2.60	Nil	1.65	Nil	2.09	Nil
2	1.60	"	2.56	"	1.64	"	2.10	"
3	4.36	18.60	2.50	"	1.63	"	2.12	"
4	7.30	59.00	2.47	"	1.75	"	2.15	"
5	4.51	18.90	2.40	"	1.85	"	2.15	"
6	3.02	2.60	2.40	"	3.38	3.60	2.15	"
7	2.78	1.35	2.36	"	3.15	2.30	2.15	"
8	2.70	0.85	2.35	"	2.86	1.15	2.16	"
9	2.64	0.50	2.34	"	2.72	0.80	2.20	"
10	2.60	0.20	2.33	"	2.77	0.85	2.23	"
11	2.55	Nil	2.30	"	2.65	0.50	2.25	"
12	2.56	"	2.27	"	2.63	0.40	2.25	"
13	2.46	"	2.26	"	2.56	0.20	2.42	"
14	2.35	"	2.25	"	2.42	Nil	2.70	1.05
15	2.30	"	2.24	"	2.42	"	2.65	0.95
16	2.26	"	2.24	"	2.40	"	2.60	0.85
17	2.35	"	2.25	"	2.35	"	2.56	0.80
18	2.30	"	2.25	"	2.34	"	2.55	0.70
19	4.59	13.70	2.06	"	2.32	"	2.55	0.70
20	3.89	5.00	2.05	"	2.30	"	2.47	0.60
21	3.05	1.10	2.00	"	2.25	"	2.43	0.50
22	2.60	0.10	1.97	"	2.25	"	2.41	Nil
23	2.35	Nil	1.95	"	2.24	"	2.40	"
24	2.45	"	1.95	"	2.20	"	2.40	"
25	2.40	"	1.94	"	2.16	"	2.38	"
26	2.68	0.15	1.92	"	2.15	"	2.38	"
27	2.82	0.30	1.84	"	2.15	"	2.36	"
28	2.86	0.40	1.83	"	2.11	"	2.35	"
29	2.75	0.15	1.81	"	2.10	"	2.35	"
30	2.46	Nil	1.77	"	2.09	"	2.35	"
31	2.66	"	1.70	"			2.35	" s

s Shifting conditions, June 14 to Oct. 31.

MONTHLY DISCHARGE of Ketchum creek at Pickett's ranch, for 1915-16

(Drainage area 76 square miles)

MONTH	DISCHARGE IN SECOND-FeET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
1915						
May (17-31)	0.87	Nil	0.13	0.002	0.00	4
June	Nil	"	Nil	Nil	0.00	0
July	41.00	"	5.20	0.068	0.08	320
August	31.00	"	3.00	0.039	0.04	184
September	Nil	"	Nil	Nil	0.00	0
October	"	"	"	"	0.00	0
The period.					0.12	508
1916						
February (18-29)	41.00	3.20	19.70	0.259	0.12	469
March	141.00	Nil	18.10	0.238	0.27	1,113
April	3.00	"	0.63	0.008	0.01	37
May	36.00	"	2.30	0.030	0.03	141
June	46.00	"	5.90	0.780	0.09	351
July	59.00	"	4.00	0.053	0.06	246
August	Nil	"	Nil	Nil	0.00	000
September	3.60	"	0.33	0.004	0.00	20
October	1.05	"	0.20	0.003	0.00	12
The period.					0.58	2,389

SESSIONAL PAPER No. 25B

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Pakowki Lake drainage basin, in 1916

Date	Engineer	Stream	Location	Width	Area of Section	Mean Velocity	Discharge ^c
				<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
Mar. 22	L. J. Gleeson	Canal creek	SW.-27-3-6-4	13.40	6.36	0.57	3.60
Mar. 25	do	" "	"	14.2	6.35	0.22	1.41
April 4	do	" "	"	2.4	3.24	0.26	0.85
April 11	do	" "	"				Nil
May 18	H. W. Rowley	" "	"				"
June 13	do	" "	"	16.5	6.67	1.04	6.90
July 8	do	" "	"	17.0	9.10	0.74	6.10
July 31	do	" "	"				Nil
Aug. 19	do	" "	"				"
Sept. 14	do	" "	"				"
Oct. 3	do	" "	"				"
Nov. 3	do	" "	"				"
Mar. 27	L. J. Gleeson	South branch Many-berries creek	SW.-7-5-5-4	12.4	13.30	1.07	14.20
April 7	do	" "	"				0.13 ^w

^w Discharge determined by using a 15-inch weir.

SAGE CREEK DRAINAGE BASIN

General Description

Sage creek is a small stream of little importance which rises in Township 5, Range 4, West of the 4th Meridian, and flows southerly, crossing the international boundary in Range 2.

The stream has no definite or permanent source of supply, and derives its discharge principally from the melting snow which accumulates in numerous coulees during the winter months. The period of flow, therefore, is generally confined to the spring months while the melting snow is passing off. Heavy rains sometimes cause a flow, but, the drainage area being absolutely devoid of tree growth, the run-off is very rapid.

After entering the United States, Sage creek spreads out over a large dry lake which has no outlet. This lake is about ten miles long and averages one and one-half miles in width, and lies close to the boundary. The lake is bounded on the south by a low range of hills, and at some time has held two or three feet of water at its deepest parts.

A station was maintained near Wild Horse Police Detachment during 1916.

SAGE CREEK AT WILD HORSE POLICE DETACHMENT

Location.—On the NE. $\frac{1}{4}$ Sec. 9, Tp. 1, Rge. 2, W. 4th Mer., near Wild Horse Police Detachment.

Records available.—Estimated discharge records for 1910-13, based on discharge measurements made in 1915; from March 28 to October 31, 1916, by usual method of discharge curve and daily gauge heights.

Gauge.—Vertical staff. Zero of gauge maintained at 93.36 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Discharge measurements.—Made with current-meter by wading, or from highway bridge one-half mile above, or with a weir.

Channel.—Composed of hard clay and well grassed over. Practically permanent.

Observer.—Geo. Sherwood.

Remarks.—During flood stage, about gauge height 5.50 feet, this creek overflows at several points above, draining into sloughs and Milk River lake, never returning to the creek. For this reason the records at this station do not represent the total run-off for this drainage basin.

DISCHARGE MEASUREMENTS of Sage creek at Wild Horse police detachment, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 28.....	H. W. Rowley.....	20.5	40.60	0.81	4.14	33.0m
Mar. 29.....	do.....	12.5	51.70	0.97	4.74	50.0m
April 6.....	do.....	10.0	8.80	0.59	2.47	5.2n
April 8.....	do.....	10.0	8.00	0.50	2.39	4.0n
April 13.....	do.....	10.5	12.60	0.76	2.79	9.5n
May 3.....	do.....				1.76	Nil
May 16.....	do.....				Dry	Nil
June 8.....	do.....	11.5	5.07	0.47	2.24	2.4n
July 6.....	do.....	13.5	66.60	1.05	5.53	70.0m
July 27.....	do.....	11.0	3.80	0.63	2.28	2.4n
Aug. 16.....	do.....	13.0	6.20	0.56	2.46	3.5n
Sept. 12.....	do.....	13.0	6.70	0.60	2.47	4.0n
Oct. 1.....	Newhall and Rowley.....				1.45	Nil
Nov. 1.....	H. W. Rowley.....				1.73	Nil

m Measurement made at miscellaneous sections above gauge.

n Measurement made at miscellaneous sections below gauge.

DAILY GAUGE HEIGHT AND DISCHARGE of Sage creek at Wild Horse police detachment, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....				30.00e	1.80	0.40	5.01	56.00
2.....				25.00e	1.78	0.36	4.33	38.00
3.....				20.00e	1.76	0.32	3.95	30.00
4.....				10.00e	1.75	0.30	3.13	14.30
5.....				10.00e	1.74	0.28	2.58	6.10
6.....			2.47	5.20d	1.72	0.24	2.43	4.30
7.....			2.44	4.40		Nil	2.35	3.50
8.....			2.34	3.40		"	2.23	2.40
9.....			2.29	2.90		"	2.20	2.10
10.....			2.24	2.50		"	2.17	1.92
11.....			2.29	2.90		"	2.12	1.62
12.....			2.39	3.90		"	2.67	7.20
13.....			2.64	6.80		"	5.10	58.00
14.....			2.72	7.90		"	4.04	32.00
15.....			2.64	6.80		"	3.49	21.00
16.....			2.49	5.00		"	3.30	17.20
17.....			2.44	4.40		"	3.04	12.80
18.....			2.49	5.00		"	2.72	7.90
19.....			2.44	4.40		"	2.50	5.10
20.....			2.31	3.10		"	2.32	3.20
21.....			2.21	2.20		"	2.97	11.70
22.....			2.17	1.92		"	4.84	51.00
23.....			2.11	1.56		"	4.30	38.00
24.....			2.06	1.34		"	4.21	36.00
25.....			2.02	1.18		"	4.09	33.00
26.....			1.94	0.86		"	3.69	24.00
27.....			1.90	0.70		"	3.14	14.50
28.....	4.14	33d	1.89	0.67	2.53	5.50	2.80	9.00
29.....	4.74	50d	1.89	0.67	3.65	24.00	2.54	5.60
30.....			1.82	0.46	3.63	23.00	2.38	3.80
31.....					5.02	56.00		

d Actual measurement.

e Discharge estimated from data collected in field.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Sage creek at Wild Horse police detachment, for 1916.
—Concluded

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	2.29	2.90	2.20	2.10	1.68	0.18	1.45	Nil
2.....	2.19	2.00	2.16	1.86	1.60	0.10	1.40	"
3.....	3.30	17.20	2.12	1.62	1.52	0.02	"	"
4.....	5.44	67.00	2.05	1.30	1.48	Nil	"	"
5.....	5.24	62.00	2.00	1.10	1.44	"	"	"
6.....	5.14	59.00	1.95	0.90	4.12	34.00	"	"
7.....	4.74	48.00	1.90	0.70	5.28	63.00	1.34	"
8.....	4.34	39.00	1.90	0.70	4.60	45.00	1.79	0.38
9.....	4.09	33.00	3.15	14.60	3.50	21.00	1.84	0.52
10.....	3.14	14.50	5.10	58.00	3.00	12.20	1.99	1.06
11.....	2.99	12.00	4.82	51.00	2.70	7.60	2.09	1.46
12.....	2.89	10.40	4.30	38.00	2.48	4.90	2.21	2.20
13.....	2.84	9.60	3.90	29.00	2.42	4.20	2.29	2.90
14.....	2.74	8.20	3.25	16.40	2.35	3.50	2.37	3.70
15.....	2.59	6.20	3.18	15.20	2.20	2.10	2.34	3.40
16.....	2.49	5.00	3.08	13.50	2.12	1.62	2.34	3.40
17.....	2.44	4.40	3.00	12.20	2.02	1.18	2.27	2.70
18.....	2.39	3.90	2.70	7.60	2.00	1.10	2.17	1.92
19.....	2.74	8.20	2.32	3.20	1.96	0.94	2.09	1.46
20.....	4.64	46.00	2.10	1.50	1.93	0.82	2.04	1.26
21.....	4.24	36.00	2.04	1.26	1.90	0.70	2.01	1.14
22.....	3.59	22.00	1.98	1.02	1.85	0.55	1.99	1.06
23.....	3.14	14.50	1.92	0.78	1.78	0.36	1.97	0.98
24.....	2.96	11.60	1.85	0.55	1.72	0.24	1.94	0.86
25.....	2.62	6.60	1.80	0.40	1.68	0.18	1.91	0.74
26.....	2.39	3.90	1.76	0.32	1.64	0.14	1.89	0.67
27.....	2.29	2.90	1.85	0.55	1.60	0.10	1.85	0.55
28.....	2.10	1.50	1.82	0.46	1.56	0.06	1.81	0.43
29.....	2.05	1.30	1.80	0.40	1.50	Nil	1.79	0.38
30.....	2.25	2.60	1.75	0.30	1.48	"	1.77	0.34
31.....	2.22	2.30	1.72	0.24	"	"	1.74	0.28

MONTHLY DISCHARGE of Sage creek at Wild Horse police detachment for 1916,

(Drainage area 188 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March.....			48.00x	0.255	0.29	2,951
April.....	30.0	0.46	5.80	0.031	0.03	345
May.....	56.0	Nil	3.60	0.019	0.02	221
June.....	58.0	1.62	18.40	0.098	0.11	1,095
July.....	67.0	1.30	18.20	0.097	0.11	1,119
August.....	58.0	0.24	8.90	0.047	0.05	547
September.....	63.0	Nil	6.90	0.037	0.04	411
October.....	3.7	Nil	1.09	0.006	0.01	67
The period.....					0.66	6,756

x Discharge estimated from data collected in the field.

C. A. WILEY WEST DITCH FROM SAGE CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 3, Tp. 1, Rge. 2, W. 4th Mer., near Sage Creek post office.

Gauge.—Vertical staff; zero of gauge maintained at 97.10 feet.

Bench-mark.—Same as for Wiley's East ditch.

Discharge measurements.—Made with meter or weir.

Observer.—J. H. Miller.

Remarks.—There was no flow at each of the four visits by the district engineer during 1916, and it is understood that no water has been diverted since the station was established on August 11, 1915.

C. A. WILEY EAST DITCH FROM SAGE CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 3, Tp. 1, Rge. 2, W. 4th Mer., near Sage Creek post office.

Gauge.—Vertical staff; zero of gauge maintained at 96.70 feet.

Bench-mark.—Consists of three-fourths inch iron post, 4 feet long with 8-inch right angle bend at lower end. Assumed elevation 100.00 feet, located on the left bank.

Discharge measurements.—Made with current-meter or weir.

Observer.—J. H. Miller.

Remarks.—There was no flow at each of the four visits by the district engineer during 1916, and it is understood that no water has been diverted since the station was established on August 11, 1915.

LODGE CREEK DRAINAGE BASIN

General Description

Lodge creek, which rises in Township 7, Range 3, West of the 4th Meridian, flows in a southerly direction for about twelve miles, then turns southeastward, and crosses the international boundary in Section 4, Township 2, Range 29, West of the 3rd Meridian.

Near its head the valley is very deep and narrow, but it broadens out considerably lower down, giving rise to large flats and meadows. The upper part of the drainage basin is cut up to a great extent by deep coulees, which drain into the creek. This part of the creek is thickly covered with brush along the banks, but lower down it is totally devoid of tree growth. The valley is rather unproductive owing to the absence of moisture, but a few good hay meadows have been developed along its course through the storage of the flood waters and their application to the soil by irrigation. As is the case with many of the streams in this locality, the flow in Lodge creek is not continuous throughout the year, the creek being dry, with the exception of pools of standing water, during the greater part of the summer months. At flood stages the creek carries a considerable amount of water and as a result its channel is wide and well defined throughout the whole length of its course.

The station at Willow Creek Police Detachment was the only station on the main stream maintained during 1916.

ENGLISH DITCH FROM EAST BRANCH OF LODGE CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 12, Tp. 7, Rge. 3, W. 4th Mer., 360 feet above two-way gate where first lateral is taken out of main ditch.

Records available.—For the irrigation season of 1916.

Gauge.—Vertical staff driven into bed of the stream near the left bank. Elevation of zero of gauge maintained at 97.69 feet since establishment.

Bench-mark.—Permanent iron bench-mark, located in the left bank near the gauge; assumed elevation 100.00 feet.

Channel.—Composed of gravel and loam.

Discharge measurements.—Made with current-meter or weir.

Observer.—James English.

SESSIONAL PAPER No. 25B

DISCHARGE MEASUREMENTS of English ditch from East branch of Lodge creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 8	H. W. Rowley	4.0	2.18	1.06	0.85	2.30
May 20	do	3.8	2.04	0.98	0.74	1.80
June 17	do				Dry	Nil
July 12	do				"	"
Aug. 2	do				"	"
Aug. 22	do				"	"
Sept. 19	do				"	"
Nov. 6	do				"	"

DAILY GAUGE HEIGHT AND DISCHARGE of English ditch from East branch of Lodge creek, for 1916

Day	MAY		MAY			JUNE			JUNE		
	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge
	Feet	Sec.-ft.		Feet	Sec.-ft.		Feet	Sec.-ft.		Feet	Sec.-ft.
3	1.09h	4.1	14	0.84	2.20	3	0.99h	3.2	19	0.94h	2.8
4	0.92	2.7	15	0.82	2.10	4	0.99	3.2	20	0.94	2.8
5	0.94	2.8	16	0.84	2.20	5	1.04	3.6	21	0.91	2.1
6	0.89	2.5	17	0.79	2.00	6	1.09	4.1	22	0.91	2.6
7	0.89	2.5	18	0.76	1.88	7	1.04	3.6	23	0.91	2.6
8	0.85	2.3	19	0.74	1.80	8	1.00	3.3	24	0.90	2.6
9	0.89	2.5	20	0.74	1.80	9	0.94	2.8	25	0.90	2.6
10	0.89	2.5	21	0.76	1.88	10	0.94h	2.8	26	0.90	2.6
11	0.86	2.4	22	0.79	2.00				27	0.90	2.6
12	0.84	2.2	23	0.96	3.00				28	0.90	2.6
13	0.82	2.1	24	0.94h	2.80				29	0.94h	2.8

h Headgate open May 3 to 24, June 3 to 10 and June 19 to 29.

MONTHLY DISCHARGE of English ditch from East branch of Lodge creek, for 1916

MONTH	DISCHARGE IN SECOND-FeET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
May (3-24)	4.1	1.80	2.4			105
June (3-10) and (19-29)	4.1	2.10	2.9			109
The period						214

EAST BRANCH LODGE CREEK AT ENGLISH'S RANCH

Location.—On the SE. $\frac{1}{4}$ Sec. 1, Tp. 7, Rge. 3, W. 4th Mer., at James English's ranch.

Records available.—October 7, 1911, to October 31, 1916.

Gauge.—Vertical staff. Zero elevation of gauge maintained at 95.38 feet during 1911; zero elevation of gauge maintained at 95.43 feet during 1912; zero elevation of gauge maintained at 95.35 feet during 1913-16.

Bench-mark.—Permanent iron bench-mark, assumed elevation 100.00 feet.

Channel.—Not likely to shift except during floods.

Discharge measurements.—Made with current-meter by wading or with weir.

Winter flow.—Station discontinued during winter season.

Control.—On August 19, 1915, an artificial log control was installed at this station.

Diversions.—Water is diverted for irrigation, about three miles above this station, by James English.

DISCHARGE MEASUREMENTS of East branch of Lodge creek at English's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 29.....	P. A. Fetterley.....	10.9	4.83	1.52	2.75	7.40 _m
Mar. 30.....	do.....	11.3	6.19	0.55	2.76	3.40 _m
April 10.....	do.....	11.5	9.95	1.03	1.59	10.10 _m
April 10.....	do.....	11.5	9.95	1.02	1.60	10.20 _m
April 11.....	do.....	11.5	10.40	1.22	1.64	12.70 _m
May 8.....	H. W. Rowley.....				1.12	1.35 _w
May 20.....	do.....				1.02	0.41 _w
June 17.....	do.....	13.0	12.00	0.97	1.80	11.60 _n
July 12.....	do.....	12.0	7.50	0.41	1.55	3.00 _n
Aug. 3.....	do.....				1.43	0.82 _w
Aug. 23.....	do.....				1.42	0.73 _w
Sept. 19.....	do.....				1.40	0.66 _w
Oct. 8.....	do.....	11.0	4.50	1.61	1.56	2.80 _m
Nov. 7.....	do.....	5.0	2.60	0.61	1.65 _c	1.59 _n

c Gauge height affected by ice on control.

m Discharge measured at miscellaneous sections above gauge.

n Discharge measured at miscellaneous sections below gauge.

w Discharge measured with a weir.

DAILY GAUGE HEIGHT AND DISCHARGE of East branch of Lodge creek at English's ranch, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			3.65	25.0 _e	2.50	69.0 _e	1.30	3.30	2.37	60.0
2.....				25.0 _e	2.45	65.0 _e	1.30	3.30	2.35	58.0
3.....				20.0 _e	2.15	45.0 _e	1.40	4.70	2.30	55.0
4.....				20.0 _e	2.15	45.0 _e	1.43	5.20	2.25	52.0
5.....				20.0 _e	2.00	35.0 _e	1.30	3.30	2.40	62.0
6.....				20.0 _e	1.85	25.0 _e	1.20	2.10	2.35	58.0
7.....				15.0 _e	1.40	14.70 _e	1.20	2.10	2.20	48.0
8.....				15.0 _e	1.65	13.20 _e	1.12	1.30	1.65	13.2
9.....				15.0 _e	1.30	13.30 _e	1.10	1.10	1.55	8.3
10.....				15.0 _e	1.70 _c	16.20 _e	1.08	0.92	2.76	90.0
11.....			4.40	45.0 _e	1.65	13.2	1.05	0.66	4.62	323.0
12.....			4.50	50.0 _e	1.57	9.1	1.05	0.66	2.55	62.0
13.....			4.55	50.0 _e	1.50	6.7	1.05	0.66	2.30	41.0
14.....			4.60	60.0 _e	1.45	5.6	1.01	0.34	2.10	28.0
15.....			4.60	60.0 _e	1.40	4.7	1.01	0.34	2.00	22.0
16.....			4.60	60.0 _e	1.40	4.7	1.01	0.34	1.90	16.6
17.....	4.15 _c	40 _e	4.65	50.0 _e	1.40	4.7	1.01	0.34	1.80	11.6
18.....	4.15	40 _e	4.65	50.0 _e	1.35	4.0	1.01	0.34	1.65	5.0
19.....	4.25	45 _e	4.70	70.0 _e	1.30	3.3	1.01	0.34	2.12	29.0
20.....	4.30	50 _e	4.75	70.0 _e	1.40	4.7	1.02	0.42	2.00	22.0
21.....	4.45	60 _e	4.60	80.0 _e	1.35	4.0	1.03	0.50	1.90	16.6
22.....	4.55	65 _e	3.95	40.0 _e	1.40	4.7	1.04	0.58	1.80	11.6
23.....	4.50	65 _e	3.80	25.0 _e	1.30	3.3	1.53	7.70	1.70	6.5
24.....	4.30	50 _e	3.75	20.0 _e	1.28	3.1	1.70	16.20	1.70	6.5
25.....	4.25	45 _e	3.60	15.0 _e	1.23	2.5	1.60	10.40	1.70	6.5
26.....	4.25	45 _e	3.55	7.4 _e	1.20	2.1	1.70	16.20	1.70	6.5
27.....	4.00	35 _e	3.55	7.4 _e	1.23	2.5	2.88	101.00	1.65	5.0
28.....	3.85	25 _e	3.55	7.4 _e	1.22	2.3	3.50	168.00	1.60	3.8
29.....	3.75	25 _e	2.75	7.4 _d	1.28	3.1	3.75	198.00	2.60	66.0
30.....			2.75	3.4 _d	1.30	3.3	3.66	187.00	2.50	57.0
31.....			2.60	3.0 _e			2.50	69.00		

c-c Gauge heights affected by ice.

d Actual measurement.

e Discharge estimated from remarks furnished by observer.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of East branch of Lodge creek at English's ranch, for 1916
—Concluded

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	2.00	22.00	1.40	0.62	1.20	0.02	1.45	1.07
2.....	2.25	38.00	2.10	28.00	1.20	0.02	1.50	1.77
3.....	2.53	60.00	2.00	22.00	.....	2.50 ^e	1.55	2.70
4.....	2.50	57.00	1.68	5.90	1.65	5.00	1.55	2.70
5.....	2.25	38.00	1.60	3.80	1.85	14.10	1.56	2.90
6.....	.....	30.00 ^e	.....	3.15 ^e	1.75	8.50	1.56	2.90
7.....	2.00	22.00	1.54	2.50	1.65	5.00	1.58	3.40
8.....	2.00	22.00	1.50	1.77	1.60	3.80	1.56	2.90
9.....	1.90	16.60	1.50	1.77	1.55	2.70	1.60	3.80
10.....	1.80	11.60	1.45	1.07	1.50	1.77	1.58	3.40
11.....	1.60	3.80	1.45	1.07	1.45	1.07	1.58	3.40
12.....	1.56	2.90	1.45	1.07	1.45	1.07	1.55	2.70
13.....	1.50	1.77	1.45	1.07	1.45	1.07	1.53	2.30
14.....	1.50	1.77	1.45	1.07	1.45	1.07	1.50	1.77
15.....	.....	1.42 ^e	1.50	1.77	1.40	0.62	1.50	1.77
16.....	1.45	1.07	1.50	1.77	1.40	0.62	1.50	1.77
17.....	1.45	1.07	1.55	2.70	.....	0.57 ^e	1.50	1.77
18.....	1.70	6.50	1.55	2.70	1.38	0.52	1.50	1.77
19.....	1.70	6.50	1.50	1.77	1.40	0.62	1.50	1.77
20.....	1.60	3.80	.....	1.42 ^e	1.42	0.80	.....	1.90 ^e
21.....	1.50	1.77	1.45	1.07	1.42	0.80	.....	2.00 ^e
22.....	1.50	1.77	1.42	0.80	1.43	0.89	1.52	2.10
23.....	1.48	1.49	1.40	0.62	1.43	0.89	1.54	2.50
24.....	1.45	1.07	1.40	0.62	1.43	0.89	1.56	2.90
25.....	1.45	1.07	1.38	0.52	1.45	1.07	1.56	2.90
26.....	1.45	1.07	1.35	0.36	1.48	1.49	1.58	3.40
27.....	1.45	1.07	1.32	0.26	1.50	1.77	1.58	3.40
28.....	1.45	1.07	1.30	0.19	1.45	1.07	.....	3.05 ^e
29.....	1.43	0.89	1.30	0.19	1.43	0.89	1.55	2.70
30.....	1.43	0.89	1.20	0.02	1.43	0.89	1.55	2.70
31.....	1.43	0.89	1.25	0.09	.....	.....	1.55	2.70

^e Discharge estimated.

MONTHLY DISCHARGE of East branch of Lodge creek at English's ranch, for 1916

(Drainage area 15.6 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (17-29).....	.....	.....	45.0 ^e	2.880	1.39	1,160
March.....	.....	.....	31.0 ^e	1.990	2.29	1,906
April.....	69.0	2.10	14.4	0.923	1.03	857
May.....	198.0	0.34	26.0	1.670	1.92	1,599
June.....	323.0	3.80	42.0	2.690	3.00	2,499
July.....	60.0	0.89	11.6	0.744	0.86	713
August.....	28.0	0.02	3.0	0.192	0.22	184
September.....	14.1	0.02	2.1	0.135	0.15	125
October.....	3.8	1.07	2.5	0.160	0.18	154
The period.....	.....	.....	.....	.....	11.04	9,197

^e Discharge estimated.

ANDERSON DITCH FROM EAST BRANCH OF LODGE CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 23, Tp. 6, Rge. 3, W. 4th Mer., at intake of Robert Anderson's ditch.

Records available.—For the irrigation season of 1912-1916.

Gauge.—Vertical staff; the elevation of the zero of the gauge was maintained at 97.63 feet during 1912, at 97.64 feet during 1913-14, and at 96.76 feet during 1915-16.

Bench-mark.—A permanent iron bench-mark was installed on the left bank, ten feet from the gauge and permanent weir; assumed elevation 100.00 feet.

Discharge measurements.—Made by measuring the head over a permanent 18-inch sharp crested weir, ten feet below the gauge.

Artificial control.—A permanent sharp crested rectangular weir, ten feet below the gauge; elevation of crest maintained at 97.76 feet.

Observer.—Robert Anderson.

Remarks.—There was no flow at each of five visits by the district engineer during the season of 1916, and it is understood that no water was diverted during 1916.

ROTH DITCH FROM LODGE CREEK

(Formerly called Hanckel ditch near Eagle Butte)

Location.—On NE. $\frac{1}{4}$ Sec. 30, Tp. 7, Rge. 3, W. 4th Mer., about three-quarters of a mile down stream from intake of ditch.

Gauge.—Vertical staff driven into the bed of the stream near the right bank; zero of the gauge was established and maintained at 98.38 feet.

Bench-mark.—Permanent iron bench-mark on the right bank near the gauge; assumed elevation 100.00 feet.

Channel.—Composed of gumbo.

Discharge measurements.—Made with current-meter or weir.

Remarks.—This station was established on October 4, 1915, but no records have been received. It was visited on June 16, 1916, but there was no flow and no gaugings were made. It is understood, however, that a little water was diverted during the spring.

H. A. MUDIE DITCH FROM SEXTON CREEK

Location.—On the NW. $\frac{1}{4}$ Sec. 21, Tp. 7, Rge. 3, W. 4th Mer., about one-quarter mile down stream from intake of ditch.

Gauge.—Vertical staff driven into the bed of the ditch near the right bank. The elevation of zero of gauge maintained at 97.16 feet since establishment.

Bench-mark.—Permanent iron bench-mark located near the gauge on the right bank; assumed elevation 100.00 feet.

Channel.—Composed of gumbo.

Discharge measurements.—Made with current-meter or with weir.

Observer.—H. A. Mudie.

Remarks.—This station was established September 28, 1915, by H. R. Carscallen. No records available for 1915. There was no flow at each of five visits by the district engineer during 1916, and it is understood that no water was diverted during 1916.

H. T. CLARK NORTH DITCH FROM SEXTON CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 21, Tp. 7, Rge. 3, W. 4th Mer., 430 feet below headgate of irrigation ditch.

Gauge.—Vertical staff driven into the bed of the ditch; elevation of zero maintained at 97.61 feet since establishment.

Bench-mark.—Permanent iron bench-mark located on the right bank near the gauge; assumed elevation 100.00 feet.

Channel.—Composed of sandy loam.

Discharge measurements.—Made with weir or current-meter.

Observer.—T. S. Clark.

Remarks.—Station established September 28, 1915, by H. R. Carscallen. No records were obtained in 1915, and there was no flow at each of seven visits made by the district engineer during 1916.

Ditch was, however, used for about twenty-six days during 1916. Gauge heights obtained, but not sufficient data to compute discharges. The daily discharge was, however, very small.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE OF H. T. Clark North ditch from Sexton creek, for 1916

JUNE			JUNE			JUNE		
Day	Gauge Height	Discharge	Day	Gauge Height	Discharge	Day	Gauge Height	Discharge
	<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>
1	0.47h	.....x	10	.....	.....	19	0.52	.....
2	.....	.....	11	.....	.....	20	.....	.....
3	.....	.....	12	.....	.....	21	.....	.....
4	.....	.....	13	.....	.....	22	0.62	.....
5	0.47	.....	14	.....	.....	23	.....	.....
6	.....	.....	15	.....	.....	24	.....	.....
7	0.47	.....	16	0.47	.....	25	.....	.....
8	.....	.....	17	0.49	.....	26	0.47	.....
9	.....	.....	18	0.52	.....		

h Headgate open June 1-26.

x Insufficient data to compute discharge.

Daily discharge very small.

H. T. CLARK SOUTH DITCH FROM SEXTON CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 21, Tp. 7, Rge. 4, W. 4th Mer., 140 feet below intake of ditch.

Records available.—For the irrigation season of 1916.

Gauge.—Vertical staff driven into the bed of the ditch near the left bank. Elevation of zero of gauge maintained at 95.32 feet since establishment.

Bench-mark.—Permanent iron bench-mark located at the north ditch station; assumed elevation 100.00 feet.

Channel.—Composed of sandy loam.

Discharge measurements.—Made with a weir or current-meter.

Observer.—T. S. Clark.

Remarks.—No records obtained in 1915.

DISCHARGE MEASUREMENTS OF H. T. Clark South ditch from Sexton creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 19.	H. W. Rowley	.....	.....	.....	0.69	0.60w
June 16.	do	.....	.....	.....	Dry	Nil
July 11.	do	.....	.....	.....	0.45	0.24w
Aug. 2.	do	.....	.....	.....	Dry	Nil
Aug. 22.	do	.....	.....	.....	Dry	Nil
Sept. 16.	do	.....	.....	.....	0.43	0.20w
Nov. 6.	do	.....	.....	.....	Dry	Nil

w Discharge determined by using a 15-inch weir.

DAILY GAUGE HEIGHT AND DISCHARGE of H. T. Clark South ditch from Sexton creek, for 1916

DAY	April		May		June		July		August		September	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....				0.84 ^e		1.43 ^e	0.59	0.44				0.55
2.....				0.90 ^e		1.54 ^e		0.62				0.60
3.....				0.96 ^e		1.65 ^e		0.80				0.65
4.....				1.02 ^e		1.76 ^e	0.89	0.99				0.70
5.....			0.94	1.10	1.24	1.87		0.78			0.75	0.70
6.....				1.02 ^e		1.23 ^e		0.57			0.55	0.37
7.....				0.96 ^e	0.69	0.60	0.54	0.36				0.33
8.....				0.88 ^e		^h		0.31				0.29
9.....				0.80 ^e				0.26				0.25
10.....			0.74	0.69			0.44	0.22				0.21
11.....				0.65 ^e			0.45	0.24 ^d			0.40	0.17
12.....			0.69	0.60				0.30				0.17
13.....			0.69	0.60				0.37			0.40	0.17
14.....				0.63 ^e			0.59	0.44			0.45	0.24
15.....				0.66 ^e		^h		0.50				0.22
16.....			0.74	0.69	0.54	0.36		0.56			0.43	0.20
17.....			0.64	0.51	0.69	0.60		0.62				0.19
18.....			0.69	0.60	0.64	0.51	0.74	0.69				0.18
19.....			0.69 ^d	0.69	0.60	0.60		0.56			0.40	0.17
20.....	1.04	1.33		0.78 ^e		0.66 ^e	0.59	0.44				0.20
21.....	1.05	1.36		0.96 ^e		0.72 ^e	^h				0.45	0.24
22.....		1.29 ^e		1.14 ^e	0.79	0.78					0.43	0.20
23.....		1.22 ^e	1.04	1.33		0.68			^h			0.20
24.....		1.15 ^e	0.94	1.10		0.58			0.40	0.17		0.21
25.....	0.94	1.10		1.14 ^e		0.47				0.22		0.21
26.....	0.84	0.88		1.18 ^e	0.54	0.36				0.27		0.22
27.....	1.04	1.33		1.22 ^e		0.39				0.31		0.23
28.....		1.10 ^e		1.26 ^e		0.42				0.36		0.23
29.....	0.84	0.88		1.30 ^e	0.59	0.44				0.40		0.24
30.....	0.79	0.78		1.31 ^e		0.50				0.45	0.45 ^h	0.24
31.....			1.04	1.33						0.50		

^e Discharge estimated.^h Headgate closed, June 8 to 15, July 21 to August 23, and September 30 to end of season.^d Actual measurement.

MONTHLY DISCHARGE of H. T. Clark South ditch from Sexton creek, for 1916

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April (20-30).....	1.36	0.78	1.13			25
May.....	1.33	0.51	0.93			57
June (1-7 and 16-30).....	1.87	0.36	0.82			36
July (1-20).....	0.99	0.22	0.50			20
August (24-31).....	0.50	0.17	0.34			5
September.....	0.70	0.17	0.29			17
The period.....						160

SESSIONAL PAPER No. 25B

JOHN READ DITCH FROM MICHEL COULEE

Location.—On the NE. $\frac{1}{4}$ Sec. 33, Tp. 6, Rge. 3, W. 4th Mer., 90 feet below point of ditch from Michel Coulee.

Gauge.—Vertical staff gauge driven in the bed of the ditch near the left bank; elevation of zero maintained at 95.45 feet since establishment.

Bench-mark.—Top of iron post on the left bank of ditch located near the gauge; assumed elevation 100.00 feet.

Channel.—Composed of gumbo.

Discharge measurements.—Made with a current-meter or with a weir.

Observer.—None.

Remarks.—This station was established by H. R. Carscallen, September 28, 1915. No records available for 1915. There was no flow at each of four visits made by the district engineer during 1916, and it is understood that no water was diverted during 1916.

JOHN READ DITCH FROM READ CREEK

Location.—On the NE. $\frac{1}{4}$ Sec. 34, Tp. 6, Rge. 3, W. 4th Mer., 300 feet down stream from intake of ditch.

Gauge.—Vertical staff driven into bed of stream near right bank; zero of gauge maintained at 97.30 feet since establishment.

Bench-mark.—Permanent iron bench-mark on the left bank of ditch, near the gauge; assumed elevation 100.00 feet.

Channel.—Composed of sandy loam.

Discharge measurements.—Made with current-meter or with a weir.

Observer.—None.

Remarks.—This station was established September 27, 1915, by H. R. Carscallen. No records available for 1915. There was no flow at each of four visits made by the district engineer during 1916, and it is understood that no water was diverted during 1916.

J. R. HARTT DITCH FROM LODGE CREEK

Location.—On NE. $\frac{1}{4}$ Sec. 15, Tp. 6, Rge. 3, W. 4th Mer., about one-half mile down stream from intake of irrigation ditch.

Gauge.—Vertical staff fastened to post driven into bed of ditch near right bank; elevation of zero maintained at 97.48 feet.

Bench-mark.—Permanent iron bench-mark located on the right bank near the gauge; assumed elevation 100.00 feet.

Channel.—Composed of gravel and gumbo.

Observer.—J. R. Hartt.

Remarks.—Station established September 27, by H. R. Carscallen; no records obtained during 1915. There was no flow at each of four visits made by the district engineer during the season, and it is understood that very little, if any, water was used during 1916.

LODGE CREEK AT HARTT'S RANCH

Location.—On the NW. $\frac{1}{4}$ Sec. 10, Tp. 6, Rge. 3, W. 4th Mer., at Ed. Hartt's ranch.

Records available.—July 22, 1909, to June 8, 1915.

Remarks.—This station was discontinued June 8, 1915.

MEAN MONTHLY DISCHARGE in Second-feet of Lodge creek at Hartt's ranch

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		2.10	Nil	Nil	1.74	0.96	59
November.....		2.00 ^b	" ^d				
December.....							
January.....							
February.....							
March.....				26.00 ^e	43.00 ^f		
April.....	17.5 ^a	205.00 ^c	87.00	40.00	40.00	56.00	3,314
May.....	9.1	24.00	12.00	2.80	2.70	10.10	627
June.....	12.8	2.30	0.87	0.83	42.00 ^h	4.20	250
July.....	6.1	Nil	0.25	Nil		1.60	97
August.....	Nil	"	Nil	"		Nil	Nil
September.....	7.7	"	"	"		1.92	115
Total in acre-ft.....	2,358	12,352	5,988	3,533	4,265		4,462

a 25-30.

b 1-3.

c 5-30.

d 1-15.

e 14-31.

f 21-31.

h 1-8.

A. J. SUISTE NORTH DITCH NEAR EAGLE BUTTE

Location.—On the NE. $\frac{1}{4}$ Sec. 9, Tp. 6, Rge. 3, W. 4th Mer., one-quarter of a mile below intake of ditch.

Gauge.—Vertical staff driven into the bed of the stream near the left bank. Zero of gauge maintained at 99.88 feet since establishment.

Bench-mark.—Top of three-quarter inch iron post located on the right bank near the gauge; assumed elevation 100.00 feet.

Channel.—Composed of gumbo.

Discharge measurements.—Made with current-meter or weir.

Observer.—J. E. Hartt.

Remarks.—This station was established September 27, 1915, by H. R. Carscallen, too late in the season to obtain records for the irrigation season of 1915. There was no flow at each of the four visits by the district engineer during 1916, and it is understood that no water was diverted during 1916.

A. J. SUISTE SOUTH DITCH NEAR EAGLE BUTTE

Location.—On the NE. $\frac{1}{4}$ Sec. 4, Tp. 6, Rge. 3, W. 4th Mer., fifty feet below dam and intake of ditch.

Gauge.—Vertical staff driven into bed of stream near the right bank. Elevation of zero of gauge maintained at 96.47 feet since establishment.

Bench-mark.—Top of a three-quarter inch iron post located on the right bank near the gauge; assumed elevation 100.00 feet.

Channel.—Composed of gumbo.

Discharge measurements.—Made with current-meter or weir.

Observer.—J. E. Hartt.

Remarks.—This station was established September 27, 1915, by H. R. Carscallen, too late to obtain records for the irrigation season of 1915. There was no flow at each of four visits by the district engineer during 1916, and it is understood that no water was diverted during 1916.

WM. MITCHELL UPPER DITCH FROM LODGE CREEK

Location.—On the NE. $\frac{1}{4}$ Sec. 29, Tp. 5, Rge. 2, W. 4th Mer., about one mile down stream from dam and intake.

Gauge.—Vertical staff driven in the bed of the ditch near the left bank. The zero of the gauge was established and maintained at 97.05 feet.

Bench-mark.—Permanent iron bench-mark 320 feet down stream from the gauge on the left bank; assumed elevation 100.00 feet.

Channel.—Composed of gravel and gumbo.

Discharge measurements.—Made with current-meter or weir.

Artificial control.—A log control was placed in the bed of the ditch about 30 feet below the gauge.

SESSIONAL PAPER No. 25b

Observer.—James Mitchell.

Remarks.—This station was established by H. R. Carscallen, July 6, 1915, too late to obtain records for the irrigation season of 1915. The ditch was used for a few days during the spring floods of 1915. There was no flow at each of four visits by the district engineer during 1916, and it is understood that no water was diverted during 1916.

WM. MITCHELL LOWER DITCH NEAR THELMA

Location.—On the SE. $\frac{1}{4}$ Sec. 15, Tp. 5, Rge. 2, W. 4th Mer., about 70 feet down stream from dam and intake on Spring creek.

Gauge.—Vertical staff driven into the bed of the ditch near the left bank. The zero of the gauge was established and maintained at 95.55 feet.

Bench-mark.—Top of iron pin set on the right bank ten feet from gauge; assumed elevation 100.00 feet.

Channel.—Composed of gumbo.

Discharged measurements.—Made with current-meter or with a weir.

Observer.—James Mitchell.

Remarks.—This station was established July 7, 1915, by H. R. Carscallen. No records were obtained during 1915. High water in the creek during February, 1916, flooded the ditch and washed out the weir, which was not replaced, the water running over the frozen ground into Lodge creek. There was no flow at each of four visits by the district engineer during the season and it is understood that no water was diverted during 1916, except the natural flooding in February.

M., M. M. AND J. M. SPANGLER DITCH FROM LODGE CREEK

Location.—On the NW. $\frac{1}{4}$ Sec. 24, Tp. 2, Rge. 33, W. 3rd Mer., two miles down stream from dam and one-half mile above reservoir No. 1.

Gauge.—Vertical staff driven into bed of ditch near the right bank. Zero of gauge maintained at 96.67 feet since establishment.

Bench-mark.—Permanent iron bench-mark situated six feet from the gauge on the right bank; assumed elevation 100.00 feet.

Channel.—Composed of gumbo.

Discharge measurements.—Made with current-meter or weir. Initial points of soundings is the bench-mark.

Observer.—None.

Remarks.—This station was established August 2, 1915, by H. R. Carscallen. No water was used during 1915 after station was established. There was no flow at each of seven visits made by the district engineer during 1916, and it is understood that no water was diverted during 1916.

D. A. HAMMOND DITCH FROM LODGE CREEK

Location.—On the NE. $\frac{1}{4}$ Sec. 5, Tp. 2, Rge. 29, W. 3rd Mer., about one-quarter mile up stream from two-way gate where ditch divides.

Gauge.—Vertical staff. The zero of the gauge was established and maintained at 98.58 feet.

Bench-mark.—Top of iron pin on the left bank of ditch fifteen feet from gauge; assumed elevation 100.00 feet.

Channel.—Composed of gumbo.

Discharge measurements.—Made by wading with current-meter or with a weir.

Observer.—D. A. Hammond.

Remarks.—This station was established August 2, 1915, by H. R. Carscallen, but no water used for irrigation after that date in 1915. There was no flow at each of eight visits by the district engineer during 1916, and it is understood that no water was diverted during 1916.

M. LYNCH DITCH FROM LODGE CREEK

Location.—On the NE. $\frac{1}{4}$ Sec. 19, Tp. 2, Rge. 29, W. 3rd Mer., about 500 feet down stream from flume over Lodge creek.

Gauge.—Vertical staff driven into bed of ditch near right bank. Zero of gauge maintained at 96.75 feet.

Bench-mark.—Top of iron pin located on the right bank six feet from the gauge; assumed elevation 100.00 feet.

Channel.—Composed of gumbo.

Discharge measurements.—Made with current-meter or weir. Initial point for soundings is the bench-mark.

Observer.—M. Lynch.

Remarks.—This station was established August 9, 1915, by H. R. Carscallen. No water has been used since station was established.

A. F. MOCK DITCH NEAR THELMA

Location.—On the NW. $\frac{1}{4}$ Sec. 21, Tp. 7, Rge. 2, W. 4th Mer., one-half mile below intake.

Gauge.—Vertical staff driven into the bed of the ditch near the left bank. The elevation of zero of gauge maintained at 97.24 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Composed of gravel and loam.

Discharge measurements.—Made with current-meter or weir.

Observer.—Adam Sturm.

Remarks.—This station was established September 29, 1915, by H. R. Carscallen. No water was used for irrigation during 1915 or 1916.

MUIR AND FRANTZEN DITCH FROM MIDDLE CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 36, Tp. 5, Rge. 2, W. 4th Mer., about 100 feet down stream from intake of branch ditch.

Records available.—No water used since station was established.

Gauge.—Vertical staff driven into bed of ditch near right bank; elevation of zero of gauge maintained at 96.86 feet since establishment.

Bench-mark.—Top of iron stake on the right bank eight feet from the gauge.

Channel.—Composed of gumbo.

Discharge measurements.—Made with current-meter or with a weir.

Observer.—James Mitchell.

Artificial control.—A control made of small rock was built 15 feet below the gauge.

Remarks.—There was no flow at each of six visits by the district engineer during 1916, and it is understood that no water has been diverted since the station was established in 1915.

LINK EAST DITCH, NORTH BRANCH, FROM DRY COULEE

Location.—On the SW. $\frac{1}{4}$ Sec. 32, Tp. 5, Rge. 1, W. 4th Mer., one hundred and ten feet from forks of ditch.

Gauge.—Vertical staff driven into the bed of the ditch near the left bank. Elevation of zero maintained at 99.07 feet since establishment.

Bench-mark.—The bench-mark for this station is the same as for the other two stations in Link's ditches and is located at the station on the south branch of the East ditch; assumed elevation 100.00 feet.

Channel.—Composed of gumbo.

Discharge measurements.—Made with a current-meter or with a weir.

Observer.—H. C. Link.

Remarks.—There was no flow at each of the six visits by the district engineer during 1916, and it is understood that no water has been diverted since the station was established in 1914.

LINK EAST DITCH, SOUTH BRANCH, FROM DRY COULEE

Location.—On the SW. $\frac{1}{4}$ Sec. 32, Tp. 5, Rge. 1, W. 4th Mer., sixty feet from forks of ditch.

Gauge.—Vertical staff driven into the bed of the ditch near the left bank. Zero of gauge maintained at 97.32 feet since establishment.

Bench-mark.—Top of a three-quarter inch iron post near the gauge on the right bank; assumed elevation 100.00 feet.

Channel.—Composed of gumbo.

Discharge measurements.—Made with a current-meter or weir.

Observer.—H. C. Link.

Remarks.—This station was established July 25, 1914. During early spring break-up an estimated flow of 20 acre-feet overflows from the coulee, flowing down across Mr. Link's irrigable land under the east ditch, while the ditches are still filled with snow. No records were obtained of this flow. There was no flow at each of six visits by the district engineer during 1916, and it is understood that no water was diverted during 1915 and 1916, except the natural overflow in the early spring.

LINK WEST DITCH FROM DRY COULEE

Location.—On the SW. $\frac{1}{4}$ Sec. 32, Tp. 5, Rge. 1, W. 4th Mer., about one hundred feet from the headgate.

Gauge.—Vertical staff driven into the bed of the ditch near the right bank. Zero of gauge maintained at 100.07 feet since establishment.

SESSIONAL PAPER No. 25b

Bench-mark.—Same as for Link's East ditch, south branch; assumed elevation 100.00 feet.

Channel.—Composed of gumbo with stones.

Discharge measurements.—Made with a current-meter or weir.

Observer.—H. C. Link.

Remarks.—There was no flow at each of six visits by district engineer during 1916, and it is understood that no water has been diverted since the station was established in 1914.

MIDDLE CREEK AT ROSS' RANCH

Location.—On the SW. $\frac{1}{4}$ Sec. 30 to 5, Rge. 29, W. 3rd Mer., at Maurice Ross' ranch.

Records available.—From July 20, 1909, to October 31, 1915.

Gauge.—Vertical staff. Zero of gauge maintained at 3,291.61 during 1909-10; zero of gauge maintained at 3,290.99 during 1911; zero of gauge maintained at 3,290.98 during 1912-16.

Bench-mark.—Permanent iron bench-mark; elevation 3,297.37 feet above sea-level. (Irrigation Surveys.)

Channel.—Practically permanent.

Discharge measurements.—Made with a current-meter by wading or with a weir.

Winter flow.—Station discontinued during winter season.

Artificial control.—The flow at this station is regulated to some extent by two dams, one at W. K. Wright's ranch and the other at MacKinnon's ranch.

Diversions.—Water is diverted for irrigation above this station by W. K. Wright and Angus MacKinnon.

Observer.—Mrs. W. M. Ross.

DISCHARGE MEASUREMENTS of Middle creek at Ross' ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 28	P. A. Fetterley	29.5	57.50	1.94	2.90	112.00m
Mar. 30	do	27.5	37.60	1.74	2.39	65.00m
April 1	do	24.0	19.40	1.39	1.54	27.00 m
April 5	do	17.0	16.20	0.94	1.30	15.30n
April 7	do	16.0	11.60	0.79	1.10	9.10n
April 11	do	14.2	22.60	1.27	1.51	29.00
April 14	do	14.5	14.40	1.95	1.50	28.00n
April 25	H. W. Rowley	7.0	2.95	0.54	0.69	1.58n
May 10	do				0.64	0.66w
May 29	do	18.0	18.80	1.38	1.50	26.00 m
May 30	do	26.0	27.20	1.62	1.90	44.00 m
June 22	do				0.75	0.92w
July 18	do				0.73	1.01w
Aug. 8	do				0.70	0.78w
Aug. 28	do				0.69	0.63w
Sept. 22	do				0.68	0.58w
Oct. 12	do				0.68	0.63w
Nov. 10	do				0.72c	0.52wc

m Discharge measured at miscellaneous sections above gauge.

n Discharge measured at miscellaneous sections below gauge.

w Discharge measured with sharp crested rectangular weir.

c Gauge height affected by backwater from ice on control.

DAILY GAUGE HEIGHT AND DISCHARGE of Middle creek at Ross' ranch, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			1.61	30.00	0.64	0.52	2.63	87.00
2.....	3.07	134	1.49	25.00	0.63	0.44	1.70	34.00
3.....	2.89	111	1.45	23.00	0.63	0.44	1.30	16.40
4.....	2.25	63	1.33	17.70	0.63	0.44	0.94	4.90
5.....	2.15	57	1.31	16.80	0.63	0.44	0.98	5.80
6.....		71 ^e	1.25	14.40	0.63	0.44	0.94	4.90
7.....		85 ^e	1.11	9.40	0.63	0.44	0.91	4.30
8.....	2.89	111	1.04	7.40	0.63	0.44	1.46	23.00
9.....	2.83	105	0.95	5.10	0.64	0.52	1.70	34.00
10.....	3.05	131	0.95	5.10	0.64	0.52	1.00	6.30
11.....	4.02	318	1.45	23.00	0.64	0.52	0.95	5.10
12.....	6.41	796	1.76	37.00	0.63	0.44	2.34	68.00
13.....	5.70	654	1.60	30.00	0.64	0.52	3.20	155.00
14.....	4.25	364	1.45	23.00	0.64	0.52	2.35	69.00
15.....	4.04	322	1.39	20.00	0.64	0.52	1.46	23.00
16.....	3.39	192	0.99	6.10	0.64	0.52	1.28	15.60
17.....	3.09	137	1.29	16.00	0.64	0.52	0.98	5.80
18.....	2.65	89	1.13	10.10	0.64	0.52	0.91	4.30
19.....	2.78	100	0.90	4.10	0.65	0.60	0.78	2.10
20.....	2.79	101	0.88	3.70	0.66	0.70	0.75	1.70
21.....	3.78	270	0.80	2.40	0.66	0.70	0.75	1.70
22.....	3.89	292	0.78	2.10	0.66	0.70	0.75	1.70
23.....	3.77	268	0.76	1.84	0.66	0.70	0.75	1.70
24.....	3.35	184	0.74	1.58	0.67	0.80	0.75	1.70
25.....	2.20	60	0.70	1.10	0.74	1.58	0.75	1.70
26.....	2.17	58	0.66	0.70	1.22	13.30	0.75	1.70
27.....	2.31	67	0.63	0.44	0.87	3.60	0.75	1.70
28.....	3.04	130	0.63	0.44	0.93	4.70	0.75	1.70
29.....	2.37	70	0.62	0.36	2.75	98.00	1.25	14.40
30.....	2.41	73	0.62	0.36	1.96	47.00	0.83	2.90
31.....	1.77	38			3.14	145.00		

^e Discharge estimated.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Middle creek at Ross' ranch, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	0.78	2.10	0.93	4.70	0.70	1.10	0.68	0.90
2.....	0.81	2.60	0.78	2.10	0.70	1.10	0.68	0.90
3.....	0.96	5.30	0.75	1.70	0.70	1.10	0.68	0.90
4.....	2.54	81.00	0.73	1.46	0.70	1.10	0.68	0.90
5.....	3.36	186.00	0.73	1.46	0.72	1.34	0.69	1.00
6.....	2.80	102.00	0.72	1.34	0.73	1.46	0.69	1.00
7.....		82.00 ^e	0.72	1.34	0.71	1.22	0.70	1.10
8.....		63.00 ^e	0.72	1.34	0.70	1.10	0.70	1.10
9.....	1.90	44.00	0.75	1.70	0.70	1.10	0.69	1.00
10.....	1.78	38.00	1.98	48.00	0.70	1.10	0.68	0.90
11.....	1.00	6.30	1.50	25.00	0.70	1.10	0.68	0.90
12.....	0.94	4.90	1.06	8.00	0.70	1.10	0.68	0.90
13.....	0.77	1.98	0.98	5.80	0.70	1.10	0.68	0.90
14.....	0.74	1.58	0.80	2.40	0.70	1.10	0.68	0.90
15.....	0.73	1.46	0.74	1.58	0.70	1.10		
16.....	0.72	1.34	0.80	2.40	0.70	1.10		
17.....	0.72	1.34	0.80	2.40	0.70	1.10		
18.....	0.74	1.58	0.72	1.34	0.70	1.10		
19.....	1.92	45.00	0.72	1.34	0.70	1.10		
20.....	2.39	71.00	0.71	1.22	0.70	1.10		
21.....	1.62	31.00	0.71	1.22	0.70	1.10		
22.....	1.25	14.40	0.71	1.22	0.70	1.10		
23.....	1.05	7.70	0.71	1.22	0.70	1.10		
24.....	0.94	4.90	0.71	1.22	0.70	1.10		
25.....	0.82	2.70	0.71	1.22	0.70	1.10		
26.....	0.75	1.70	0.71	1.22	0.69	1.00		
27.....	0.75	1.70	0.71	1.22	0.69	1.00		
28.....	0.74	1.58	0.70	1.10	0.68	0.90		
29.....	1.37	19.40	0.70	1.10	0.68	0.90		
30.....	1.20	12.50	0.70	1.10	0.68	0.90		
31.....	1.04	7.40	0.70	1.10				

^e Discharge estimated.

* Creek still running; no observations after October 14.

MONTHLY DISCHARGE of Middle creek at Ross' ranch, for 1916

(Drainage area 162 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (2-31).....	796.00	38.00	182.00	1.120	1.25	10,830
April.....	37.00	0.36	11.30	0.070	0.08	672
May.....	145.00	0.44	10.50	0.065	0.07	646
June.....	155.00	1.70	20.00	0.012	0.01	1,190
July.....	186.00	1.34	27.00	0.167	0.19	1,660
August.....	48.00	1.10	4.20	0.026	0.03	258
September.....	1.46	0.90	1.10	0.007	0.01	65
October (1-14).....	1.10	0.90	0.95	0.006	0.00	26
The period.....					1.64	15,347

MEAN MONTHLY DISCHARGE in Second-feet of Middle creek at Ross' ranch

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		0.36	0.42	0.50	0.38	0.25	0.37	0.36	0.95 _a	0.38	23
November		0.36 _b		0.50 _e	0.23 _g						
December											
January											
February											
March						11.90 _a	121.00 _e	182.00 _m			
April		0.95 _e	19.30 _d	341.00 _f	86.00 _f	41.00	62.00	11.30		38.0	2,269
May		0.46	3.10	5.60	0.53	0.37	0.51	10.50		3.0	185
June		0.39	0.70	0.81	0.30	0.42	0.60	20.00		3.3	197
July		0.52 _a	0.52	3.90	0.32	0.40	0.28	2.50		5.0	306
August		0.36	0.43	0.70	0.38	0.41	0.23	14.00		2.6	159
September		0.36	0.43	13.30	0.44	0.28	0.26	1.10		2.1	123
Total in acre-ft. . .	55	215	2,098	18,350	3,878	2,955	7,454	15,343			3,262

a 20-31.

b 1-14.

c 5-30.

d 11-30.

e 1-8.

f 5-30.

g 1-15.

h 15-31.

k 21-31.

m 2-31.

n 1-14.

l 9-30.

B. A. JAHN DITCH FROM MIDDLE CREEK

Location.—On the SE. $\frac{1}{4}$ Sec. 8, Tp. 4, Rge. 29, W. 3rd Mer., 700 feet down stream from intake of ditch.

Gauge.—Vertical staff driven into bed of ditch near right bank. Zero of gauge maintained at 95.45 feet.

Bench-mark.—Top of iron stake on left bank ten feet from gauge; assumed elevation 100.00 feet.

Channel.—Composed of gumbo.

Discharge measurements.—Made with weir or current-meter. Initial point for sounding is the bench-mark.

Observer.—B. A. Jahn.

Remarks.—There was no flow at each of the six visits by the district engineer during 1916, and it is understood that no water has been diverted since the station was established in 1915.

W. B. GREGG DITCH FROM MIDDLE CREEK

Location.—On the NE. $\frac{1}{4}$ Sec. 34, Tp. 3, Rge. 29, W. 3rd Mer., one mile down stream from intake of B. A. Jahn's ditch near two-way gate where B. A. Jahn diverts water for irrigation.

Gauge.—Vertical staff driven into bed of ditch near right bank. Zero of gauge maintained at 96.20 feet since establishment.

Bench-mark.—Top of iron post on the right bank, twelve feet from gauge; assumed elevation 100.00 feet.

Channel.—Composed of gumbo.

Discharge measurements.—Made with current-meter or weir.

Observer.—B. A. Jahn.

Remarks.—There was no flow at each of six visits by the district engineer during 1916, and it is understood that no water was diverted during 1916.

E. J. PEACHEY DITCH FROM MIDDLE CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 4, Tp. 3, Rge. 29, W. 3rd Mer., one-half mile below dam and intake and in the flume along cut bank of Middle creek.

Gauge.—Vertical staff nailed to right wall of flume; zero of gauge maintained at 94.10 feet since establishment.

Bench-mark.—Top of iron post located on the right bank 150 feet down stream from gauge; assumed elevation 100.00 feet.

Channel.—Wooden flume.

Discharge measurements.—Made with current-meter or weir.

Observer.—E. J. Peachey.

Remarks.—Water was used from June 23 to July 19, but insufficient data obtained to compute discharge. There was no flow at each of four visits by the district engineer during 1916, but it is understood that water was used from June 23 to July 19. We did not, however, obtain sufficient data to estimate the quantity diverted.

SESSIONAL PAPER No. 25a

DAILY GAUGE HEIGHT AND DISCHARGE of Peachey ditch from Middle creek, for 1916

JUNE			JULY			JULY		
Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>
23	0.48 ^h	.....x	1	0.55	.....	11	0.50	.....
24	0.48	.....	2	0.48	.....	12	0.50	.....
25	0.48	.....	3	0.48	.....	13	0.35	.....
26	0.70	.....	4	0.55	.....	14	0.35	.....
27	0.55	.....	5	0.60	.....	15	0.35	.....
28	0.55	.....	6	0.55	.....	16	0.25	.....
29	0.55	.....	7	0.55	.....	17	0.25	.....
30	0.48	.....	8	0.48	.....	18	0.55	.....
			9	0.48	.....	19	0.70 ^h	.....
			10	0.50	.....		

^h Headgate open, June 23 to July 19.

^x Unsufticient data collected to compute discharge, estimated average daily discharge 1.50 sec.-ft.

MIDDLE CREEK AT HAMMOND'S RANCH

Location.—On the NE. $\frac{1}{4}$ Sec. 4, Tp. 2, Rge. 29, W. 3rd Mer., at D. A. Hammond's ranch.

Records available.—Open water seasons from June 13, 1910, to October 31, 1916.

Gauge.—Vertical staff; elevation of zero of gauge maintained at 87.48 feet during 1910, and at 87.60 feet during 1911-15, and to March 24, 1916. March 25, 1916, the gauge was moved 850 feet north, 150 feet above the artificial control. Zero of gauge at new location maintained at 90.70 feet, March 25 to October 31, 1916.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Control.—An artificial control consisting of a wall of stones cemented with concrete was constructed just below the new location of gauge about the close of the 1915 season.

Discharge measurements.—Made by current-meter with cable and weights from the irrigation ditch flume just above the gauge during flood stages, by wading or with a weir during low stages.

Winter flow.—Station discontinued during winter season.

Diversions.—Water is diverted above this station by W. B. Gregg, W. S. Peachey and E. J. Jahn, for irrigation, and by the Canadian Pacific Railway Company, at Govenlock, for industrial purposes.

Observer.—Mrs. K. R. Hammond.

Accuracy.—Stage discharge relation changed slightly for low discharges during June, as the results of the artificial control being undermined and settling. Daily discharge obtained by applying mean daily gauge heights to rating table; 1915 rating table used for period, March 17 to 23.

DISCHARGE MEASUREMENTS of Middle creek at Hammond's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 25	H. W. Rowley	27	68.40	1.67	3.24	114.00
April 4	do	24	25.40	1.38	1.90	35.00 m
April 8	do	11	17.50	1.20	1.56	21.00 m
April 11	do	10	16.10	1.10	1.41	17.80 m
April 15	do	11	26.50	1.58	1.79	42.00 m
May 2	do	16	5.80	0.66	0.60	3.80 m
May 15	do	9	1.80	0.92	0.45	1.66 m
June 7	do	6	7.40	1.84	1.20	13.60 m
July 26	do	13	5.50	1.62	0.80	8.90 m
Aug. 16	do	11	5.80	0.81	0.54	4.70 m
Sept. 5	do				0.18	2.93 w
Sept. 29	Newhall and Rowley				0.13	0.10 w
Oct. 30	H. W. Rowley				0.30	1.28 w

m Discharge measured 600 feet above gauge.

w Discharge measured with weir.

DAILY GAUGE HEIGHT AND DISCHARGE of Middle creek at Hammond's ranch, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1				98.0e	0.60	3.80	2.95	95.0
2				40.0e	0.60	3.80	2.75	83.0
3				40.0e	0.59	3.70	1.98	39.0
4			1.90	35.0	0.58	3.50	1.75	28.0
5			1.90	35.0	0.56	3.20	1.55	21.0
6			1.88	34.0	0.55	3.10	1.40	17.5
7			1.87	33.0	0.53	2.80	1.20	13.6
8			1.56	21.0	0.52	2.70	1.15	12.6
9			1.43	18.2	0.50	2.40	1.08	11.3
10			1.42	17.9	0.48	2.10	1.60	23.0
11			1.41	17.7	0.47	1.98	1.54	21.0
12			1.41	15.2s	0.46	1.84	1.38	17.2
13			1.52	16.0	0.45	1.70	1.25	14.6
14			1.85	23.0s	0.45	1.70	3.00	98.0
15			1.78	29.0	0.44	1.58	2.25	55.0
16			1.62	23.0	0.44	1.58	1.90	36.0
17			1.57	22.0	0.44	1.58	1.68	28.0
18	5.50	210	1.40	17.5	0.43	1.46	1.40	20.0
19	4.60	133	1.44	18.4	0.43	1.46	1.32	18.5
20	4.00	91	1.40	17.5	0.42	1.34	1.25	17.1
21	5.00	165	1.28	15.2	0.41	1.22	1.05	13.3
22		330e	1.15	12.6	0.40	1.10	0.90	10.6
23	5.50	210	1.05	10.8	0.39	0.98	0.80	8.8
24		160e	0.97	9.5	0.39	0.98	0.70	7.2
25	3.23x	112	0.86	7.8	0.90	8.40	0.60	5.6
26	3.90	152	0.82	7.1	1.70	26.00	0.55	4.8
27		218e	0.75	6.0	1.30	15.60	0.50	4.0
28		218e	0.69	5.1	1.25	14.60	0.47	3.6
29		158e	0.65	4.5	2.15	48.00	0.45	3.3
30		158e	0.60	3.8	3.20	110.00	0.52	4.3
31		98e			2.50	68.00		

e Discharge estimated.

s to s Shifting conditions.

x Gauge moved 850 feet north, 150 feet above artificial control.

SESSIONAL PAPER No. 258

 DAILY GAUGE HEIGHT AND DISCHARGE of Middle creek at Hammond's ranch, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	0.50	4.0	0.72	7.50	0.01	Nil	0.09	Nil
2	0.47	3.6	0.60	5.60	0.00	"	0.08	"
3	0.55	4.8	0.52	4.30	0.08	"	0.15	0.30
4		6.0 ^e	0.44	3.20	0.20	0.70	0.16	0.38
5	0.70	7.2	0.40	2.70	0.30	1.60	0.14	0.24
6	2.90	92.0	0.35	2.10	0.24	1.02	0.16	0.38
7	2.28	56.0	0.31	1.70	0.15	0.30	0.13	0.18
8	1.90	36.0	0.29	1.50	0.10	Nil	0.11	0.06
9	1.50	23.0	0.53	4.50	0.50	4.00	0.14	0.24
10	1.30	18.1	0.50	4.00	0.36	2.20	0.26	1.20
11	1.10	14.2	0.42	2.90	0.29	1.50	0.45	3.30
12	0.90	10.6	0.35	3.10	0.25	1.10	0.39	2.60
13	0.70	7.2	1.10	14.20	0.24	1.02	0.36	2.20
14	0.58	5.3	1.15	15.10	0.22	0.86	0.34	2.00
15	0.40	2.7	0.90	10.60	0.20	0.70	0.32	1.80
16	0.35	2.1	0.52	4.30	0.18	0.54	0.32	1.80
17	1.30	18.1	0.45	3.30	0.16	0.38	0.31	1.70
18	1.30	18.1	0.40	2.70	0.15	0.30	0.31	1.70
19	1.07	13.7	0.33	1.90	0.14	0.24	0.30	1.60
20	0.70	7.2	0.30	1.60	0.12	0.12	0.29	1.50
21	2.05	44.0	0.24	1.02	0.10	Nil	0.28	1.40
22	1.50	23.0	0.20	0.70	0.10	"	0.28	1.40
23	1.40	20.0	0.18	0.54	0.10	"	0.28	1.40
24	1.20	16.1	0.16	0.38	0.10	"	0.28	1.40
25	0.95	11.5	0.14	0.24	0.10	"	0.28	1.40
26	0.80	8.8	0.12	0.12	0.10	"	0.28	1.40
27	1.69	7.0	0.10	Nil	0.12	0.12	0.29	1.50
28	1.05	13.3	0.08	"	0.11	0.06	0.29	1.50
29	0.88	10.2	0.07	"	0.11	0.06	0.29	1.50
30	1.55	24.0	0.05	"	0.10	Nil	0.30	1.60
31	0.90	10.6	0.03	"			0.31	1.70

^e Discharge estimated.

MONTHLY DISCHARGE of Middle creek at Hammond's ranch, for 1916

(Drainage area 315 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (17-31)	330.0	91.00	167.00	0.530	0.30	4,967
April	98.0	3.80	22.00	0.070	0.08	1,309
May	110.0	0.98	11.00	0.035	0.04	676
June	98.0	3.30	24.00	0.076	0.08	1,428
July	92.0	2.10	17.40	0.055	0.06	1,070
August	15.1	Nil	3.20	0.010	0.01	197
September	4.0	"	0.56	0.002	0.00	33
October	3.3	"	1.27	0.004	0.00	78
The period					0.57	9,758

MEAN MONTHLY DISCHARGE in Second-feet of Middle creek at Hammond's ranch

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		1.50	Nil	Nil	6.30	0.45	1.27	1.59	98
November		1.00 ^b	" ^d						
December									
January									
February									
March	4.2 ^a			20.00 ^f	50.00	167.00 ^g		50.0	3,050
April	7.5	280.00 ^c	155.00	56.00	76.00	22.00		63.0	3,766
May	3.9	12.70	6.70	1.24	1.25	11.00		6.1	377
June	2.1	2.80	1.19	Nil	2.70	24.00		5.5	325
July	6.1	0.01	1.64	"	10.50	17.40		5.9	366
August	Nil	Nil	Nil	"	9.70	3.20		2.2	132
September	44.0	"	"	"	0.40	0.56		7.5	446
Total in acre-ft.	3,954	15,515	9,807	4,167	9,464	9,708			8,560

^a 14-31.^b 1-20.^c 5-30.^d 1-15.^f 13-31.^g 17-31.

LODGE CREEK AT WILLOW CREEK POLICE DETACHMENT

Location.—On the SE. $\frac{1}{4}$ Sec. 12, Tp. 1, Rge. 29, W. 3rd Mer., at the Willow Creek R.N.W.M.P. Detachment.

Records available.—From April 25, 1910, to October 31, 1916.

Gauge.—Vertical staff; also an inclined gauge used during spring break-up and flood stages. Zero of gauge maintained at 2,722.98 feet during 1910; zero of gauge maintained at 2,721.18 feet during 1911; zero of gauge maintained at 2,721.06 feet during 1912-16.

Bench-mark.—Permanent iron bench-mark located on the right bank at the cable support. Elevation 2,734.02 feet above mean sea-level. (International Boundary Survey.)

Channel.—Practically permanent.

Discharge measurements.—Made at station from cable car, or about 1,000 feet above, by wading or with a weir.

Winter flow.—Station discontinued during winter season.

Observer.—Corp. A. R. Price.

Accuracy.—Stage discharge relation practically permanent. Rating curve well defined between 0 and 1,550 second-feet. Gauge read to hundredths daily during normal and low stages, and twice or more during flood and fluctuating stages. Daily discharge ascertained by applying mean gauge heights to the rating table. Results good. Creek still running about four second-feet at close of season.

SESSIONAL PAPER No. 25a

DISCHARGE MEASUREMENTS of Lodge creek at Willow Creek police detachment, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i> Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 27.....	H. W. Rowley.....	86	205.00	3.12	5.55	640.00
Mar. 30.....	do.....	51	89.20	3.40	4.10	302.00m
April 3.....	do.....	30	41.40	2.46	2.74	102.00m
April 8.....	do.....	30	30.40	1.74	2.25	53.00m
April 10.....	do.....	28	34.60	1.38	2.20	48.00m
April 14.....	do.....	33	40.40	2.42	2.67	98.00m
May 1.....	do.....	29	15.40	0.88	1.74	13.60m
May 13.....	do.....	21	12.40	0.52	1.63	6.40m
June 3.....	do.....	37	50.20	3.01	3.40	151.00m
June 6.....	do.....	31	30.60	1.80	2.26	55.00m
June 30.....	do.....	51	93.20	2.70	4.00	232.00
July 4.....	do.....	106	472.00	3.24	8.00	1,527.00
July 4.....	do.....	105	454.00	3.18	7.85	1,444.00
July 5.....	do.....	88	239.00	2.88	5.65	688.00
July 22.....	do.....	31	33.00	2.00	2.48	66.00m
July 26.....	do.....	21	13.20	1.89	1.92	25.00m
Aug. 15.....	do.....	27	17.00	1.10	1.85	18.70m
Sept. 2.....	do.....				1.35	0.58mw
Sept. 9.....	do.....	28	21.20	1.41	2.04	31.00m
Sept. 29.....	Newhall and Rowley.....				1.30	0.34mw
Oct. 30.....	H. W. Rowley.....	21	7.70	0.49	1.53	3.80m

m Discharge measured at miscellaneous section, above gauge.

w Measurement made with sharp-crossed rectangular weir.

DAILY GAUGE HEIGHT AND DISCHARGE of Lodge creek at Willow Creek police detachment, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.</i>
1.....			3.15	144.0	1.75	14.5	4.71	425.0
2.....			2.90	113.0	1.74	14.0	4.05	284.0
3.....			2.85	108.0	1.72	13.0	3.21	151.0
4.....			2.75	96.0	1.75	14.5	2.85	108.0
5.....			2.65	86.0	1.72	13.0	2.45	66.0
6.....			2.50	71.0	1.70	12.0	2.32	54.0
7.....			2.45	66.0	1.65	10.0	2.20	44.0
8.....			2.28	50.0	1.63	9.2	2.43	64.0
9.....			2.20	44.0	1.62	8.8	2.55	76.0
10.....			2.24	47.0	1.65	10.0	2.35	56.0
11.....			2.26	49.0	1.63	9.2	2.17	42.0
12.....			2.45	66.0	1.65	10.0	4.22	321.0
13.....	9.10	1,990	2.50	71.0	1.63	9.2	6.22	855.0
14.....	9.20	2,033	2.66	87.0	1.60	8.0	4.15	303.0
15.....	8.90	1,904	2.58	79.0	1.65	10.0	3.53	196.0
16.....	6.20	848						
17.....	4.95	485	2.42	63.0	1.63	9.2	3.02	127.0
18.....	4.85	460	2.42	63.0	1.60	8.0	2.70	91.0
19.....	4.35	344	2.35	56.0	1.59	7.7	2.45	66.0
20.....	4.30	333	2.20	44.0	1.57	7.0	2.25	48.0
21.....	4.30	333	2.15	40.0	1.55	6.3	2.15	40.0
22.....	6.10	816	2.12	38.0	1.54	6.0	2.10	36.0
23.....	7.00	1,121	2.02	30.0	1.54	6.0	2.03	31.0
24.....	7.05	1,140	1.94	25.0	1.54	6.0	2.00	29.0
25.....	5.75	708	1.90	23.0	1.57	7.0	1.95	26.0
26.....	4.80	447	1.90	23.0	1.90	23.0	1.90	23.0
27.....	4.75	435	1.84	19.4	2.05	32.0	1.85	20.0
28.....	6.75	1,032	1.82	18.2	2.40	61.0	1.80	17.0
29.....	5.10	525	1.77	15.5	2.25	48.0	1.85	20.0
30.....	4.40	354	1.74	14.0	2.40	61.0	1.83	18.8
31.....	4.15	303	1.73	13.5	3.65	214.0	3.45	184.0
	3.60	206			4.76	437.0		

DAILY GAUGE HEIGHT AND DISCHARGE of Lodge creek at Willow Creek police detachment
—Concluded

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	2.73	94.0	2.25	48.0	1.35	0.58	1.25	0.20
2	2.05	32.0	1.95	26.0	1.35	0.58	1.25	0.20
3	2.10	36.0	1.90	23.0	1.35	0.58	1.40	2.00
4	7.16	1,181.0	1.87	21.0	1.43	2.80	1.40	2.00
5	5.85	738.0	1.80	17.0	1.45	3.30	1.40	2.00
6	3.75	230.0	1.75	14.5	2.35	56.00	1.35	0.58
7	3.55	198.0	1.73	13.5	2.00	29.00	1.35	0.58
8	2.98	123.0	1.65	10.0	1.85	20.00	1.50	4.60
9	2.75	96.0	1.68	11.2	2.00	29.00	1.65	10.00
10	2.65	86.0	1.70	12.0	1.95	26.00	1.35	0.58
11	2.25	48.0	1.70	12.0	1.84	19.40	1.90	23.00
12	2.10	36.0	1.65	10.0	1.75	14.50	1.80	17.00
13	1.95	26.0	1.65	10.0	1.70	12.00	1.80	17.00
14	1.85	20.0	1.80	17.0	1.65	10.00	1.75	14.50
15	1.75	14.5	1.85	20.0	1.63	9.20	1.73	13.50
16	1.74	14.0	1.80	17.0	1.55	6.30	1.68	11.20
17	1.73	13.5	1.76	15.0	1.53	5.60	1.64	9.60
18	1.98	28.0	1.75	14.5	1.50	4.60	1.60	8.00
19	2.60	81.0	1.72	13.0	1.45	3.30	1.58	7.30
20	3.00	125.0	1.63	9.2	1.43	2.80	1.56	6.60
21	2.70	91.0	1.58	7.3	1.43	2.80	1.50	4.60
22	2.35	56.0	1.53	5.6	1.38	1.43	1.58	7.30
23	2.53	74.0	1.53	5.6	1.35	0.58	1.56	6.60
24	2.23	46.0	1.50	4.6	1.35	0.58	1.55	6.30
25	2.05	32.0	1.50	4.6	1.33	0.48	1.55	6.30
26	1.94	25.0	1.48	4.1	1.32	0.44	1.55	6.30
27	1.88	22.0	1.55	6.3	1.31	0.39	1.54	6.00
28	3.65	214.0	1.50	4.6	1.31	0.39	1.54	6.00
29	2.70	91.0	1.50	4.6	1.30	0.34	1.54	6.00
30	3.54	197.0	1.45	3.3	1.28	0.28	1.54	6.00
31	2.65	86.0	1.40	2.0			1.54	6.00

MONTHLY DISCHARGE of Lodge creek at Willow Creek police detachment, for 1916

(Drainage area 823 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (12-31)	2,033	206.00	791.0	0.961	0.71	31,371
April	144	13.50	55.0	0.067	0.07	3,273
May	437	6.00	36.0	0.044	0.05	2,214
June	855	17.00	127.0	0.154	0.17	7,557
July	1,181	13.50	134.0	0.163	0.19	8,239
August	48	2.00	12.5	0.015	0.02	769
September	56	0.28	8.8	0.011	0.01	524
October	23	0.20	7.0	0.009	0.01	430
The period					1.23	54,377

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE of Lodge creek at Willow Creek police detachment

Area of watershed 824 square miles
Average run-off per square mile 53.2 acre-feet

YEAR	Mar. Sec.-ft.	April Sec.-ft.	May Sec.-ft.	June Sec.-ft.	July Sec.-ft.	Aug. Sec.-ft.	Sept. Sec.-ft.	Oct. Sec.-ft.	Nov. Sec.-ft.	Total Acre-ft.	Remarks
1910.....		6a	1.41a	00	00	00.0	00	00.0	00.0	115a	NOTE—High discharges for 1911 and 1912 computed from two slope measurements.
1911.....	141a	106	16	16	28	00.0	168	2.0	1.3a	24,308	
1912.....	00	1,242b	26	16	00	00.0	00	00.0	00.0	66,701	
1913.....		465	24	2	2	00.2	00	00.0		29,492	
1914.....	58c	123	6	0	0	00.0	0	18.0		12,374	a Records incomplete; omitted from averages.
1915.....	110b	260	9	14	.67	25.0	1.47	00.3		29,384	b Reduced to monthly average.
1916.....	791b	55	36	127	134	12.0	9	07.0		54,377	
Average Sec.-ft.	240	375	19	25	33	5.0	26	4.0	00.0	36,106	
Average Acre-ft.	14,757	22,314	1,168	1,488	2,029	307	1,547	246	00	43,856	

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Lodge creek drainage basin, in 1916

Date	Engineer	Stream	Location	Width	Area of Section	Mean Velocity	Discharge
				Feet	Sq. ft.	Ft. per sec.	Sec.-ft.
May 26..	H. W. Rowley	Bare creek..	SW. 25-3-1-4.....	6	5.40	0.50	2.70
July 14..	do	do	do				Nil
Aug. 7..	do	do	do				"
Aug. 26..	do	do	do				"
Oct. 31..	do	do	do				"
May 9..	do	Middle creek	SW. 35-5-1-4.....				1.44w
May 23..	do	do	do				2.00w
June 19..	do	do	do	14	6.60	0.58	3.80
July 14..	do	do	do				2.10w
Aug. 4..	do	do	do				2.20w
Aug. 24..	do	do	do				0.96w
Sept. 20..	do	do	do				1.00w
Oct. 9..	do	do	do	8	3.20	0.39	1.24
Nov. 8..	do	do	do				1.62w
May 22..	do	Lodge creek	NW. 10-6-3-4.....	10	3.20	0.62	2.00
July 12..	do	do	SW. 15-6-3-4.....	11	4.60	0.91	4.20
Aug. 23..	do	do	do				0.98w
Nov. 7..	do	do	do	12	3.80	0.60	2.30
May 26..	do	do	NE. 25-3-1-4.....	16	22.40	0.98	22.00
July 15..	do	do	do	10	4.80	1.06	5.10
Aug. 7..	do	do	do	9	3.70	1.27	3.80
Aug. 26..	do	do	do				1.34w
Oct. 31..	do	do	do	7	2.70	1.78	4.80
May 18..	do	Sexton creek..	SW. 21-7-3-4.....				0.50w
June 16..	do	do	do				1.66w
July 11..	do	do	do				0.41w
Aug. 2..	do	do	do				0.17w
Aug. 22..	do	do	do				0.22w
Sept. 16..	do	do	do				0.26w

w Discharge determined by using a weir.

BATTLE CREEK DRAINAGE BASIN

General Description

Battle creek rises in Township 8, Range 2, West of the 4th Meridian, and flows in an easterly direction for about eight miles, where it crosses the 4th Meridian, then turns in a southeasterly direction and crosses the international boundary in Section 3, Township 1, Range 26, West of the 3rd Meridian, eventually emptying into Milk river near Chinook, Montana.

As is characteristic of the streams in this locality, the valley is narrow and deep near the source and gradually broadens out into large flats and meadows. These large flats are first noticed in the vicinity of Battle Creek post office. Near the head of the stream the valley is well wooded with fair sized timber, but this diminishes to a growth of willow brush along the banks and finally disappears altogether.

The chief tributaries of Battle creek are Tenmile creek joining it in Section 4, Township 6, Range 29, West of the 3rd Meridian, and Sixmile coulee, joining it in Section 21, Township 6, Range 29, West of the 3rd Meridian. Stations have been established on both of these streams, but only the one on Sixmile coulee was maintained during 1916.

Three stations were maintained on Battle creek during 1916 at the following places: Tenmile Police Detachment, Wilkes' ranch and Nash's ranch. Late in the fall a new station equipped with an automatic gauge, was established near the international boundary. It was constructed and will be maintained jointly by the United States Geological Survey and this department.

Although it will be several years before it reaches its fullest development, works for the irrigation of the flats along the creeks are increasing each year. This, it is expected, will result in a more uniform flow in the creek, as a certain amount of the water diverted by the irrigation ditches will be returned to the creek through seepage.

B. CHEESEMAN WEST DITCH FROM SIXMILE CREEK

Location.—On the SE. $\frac{1}{4}$ Sec. 12, Tp. 8, Rge. 29, W. 3rd Mer., at Ben Cheeseman's ranch buildings.

Records available.—No gauge height observations obtained as no appreciable quantity of water used since establishment of the station on June 20, 1914.

Gauge.—Vertical staff; zero elevation of gauge maintained at 94.36 feet.

Bench-mark.—Permanent iron bench-mark on the right bank established August 11, 1916. Assumed elevation 100.00 feet. Relative elevation of former wooden stake bench-mark 99.73 feet.

Discharge measurement.—Made with permanent twenty-four-inch weir, located eight feet below gauge; elevation of crest maintained at 96.11 feet.

Remarks.—Six visits were made to this station during 1916, but there was no discharge at each visit, and it is understood that very little water was diverted during 1916.

B. CHEESEMAN EAST DITCH FROM SIXMILE CREEK

Location.—On the SE. $\frac{1}{4}$ Sec. 12, Tp. 8, Rge. 29, W. 3rd Mer., 125 feet below dam.

Records available.—No water used since station was established on June 20, 1914.

Gauge.—Vertical staff; zero of gauge maintained at 94.78 since establishment.

Bench-mark.—Top of wooden stake on the left bank, opposite gauge; assumed elevation 100.00 feet.

Discharge measurements.—Made from permanent, rectangular, sharp-crested 24-inch weir, ten feet below gauge.

Remarks.—This station was visited six times during 1916, but there was no flow at each visit, and it is understood that no water was diverted during 1916.

SPANGLER DITCH FROM SIXMILE COULEE

Location.—On the SW. $\frac{1}{4}$ Sec. 6, Tp. 7, Rge. 28, W. 3rd Mer., at Spangler's ranch.

Records available.—For the irrigation seasons of 1912-16.

Gauge.—Vertical staff. Zero of gauge has been maintained at 96.57 feet since establishment.

Bench-mark.—The top of the I. P. stake; assumed elevation 100.00 feet.

Channel.—Composed of soft clay.

Discharge measurements.—Made by a current-meter or with a weir.

Observer.—J. M. Spangler.

Remarks.—Six visits were made during 1916, but there was no flow at time of each visit, and it is understood that no water was used during 1916.

SESSIONAL PAPER No. 25B

SIXMILE COULEE AT SPANGLER'S RANCH

Location.—On the SW. $\frac{1}{4}$ of Sec. 6, Tp. 7, Rge. 2S, W. 3rd Mer., near Mr. Spangler's house. The present station is 850 feet north of the first station established July 4, 1911.

Records available.—At first station from July 30, 1911, to November 7, 1911; at present station April 13, 1912, to November 1916.

Gauge.—Vertical staff; zero of gauge maintained at 90.68 feet (original station) during 1911; zero of gauge maintained at 96.73 feet during 1912-16. Gauge read by D. B. Spangler.

Bench-mark.—Permanent iron bench-mark located on the left bank, 850 feet below the gauge.

Channel.—Practically permanent.

Discharge measurements.—Made by wading or with weir.

Artificial control.—Permanent six-foot weir installed 175 feet below gauge. September 8, 1915; elevation of crest 98.99 feet.

Winter flow.—Station discontinued during winter season.

Diversions.—Water is diverted by J. M. Spangler for irrigation one-half mile up stream.

Accuracy.—Stage discharge relation practically permanent after April 20. Before this date slightly shifting owing to ice and escape of water underneath the artificial control. Gauge is read to hundredths at least once daily. Rating curve fairly well defined for all stages up to 100 second-feet. Results good. Daily discharge obtained by applying mean daily gauge heights to rating table.

DISCHARGE MEASUREMENTS of Sixmile coulee at Spangler's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 27.....	P. A. Fetterley.....	11.0	28.50	0.75	3.62	21.00 _n
April 1.....	do.....	8.5	21.00	0.49	2.97	10.20 _n
April 8.....	do.....	5.4	4.28	1.76	2.81	7.50 _n
April 15.....	do.....	5.5	4.63	1.71	2.72	7.90 _n
April 20.....	H. W. Rowley.....	5.5	3.83	2.04	2.63	7.80 _n
May 12.....	do.....				2.70	7.00 _w
May 31.....	do.....	17.0	54.80	1.61	5.09	88.00 _m
June 24.....	do.....	7.5	17.50	1.37	3.59	24.00 _n
June 26.....	do.....	8.0	15.40	1.25	3.32	19.20 _n
July 20.....	do.....				2.66	5.80 _w
Aug. 11.....	do.....				2.77	7.80 _w
Aug. 30.....	do.....				2.51	2.90 _w
Sept. 26.....	V. A. Newhall and H. W. Rowley.....				2.48	2.50 _w
Nov. 13.....	H. W. Rowley.....				2.40 _c	1.27 _w

_m Measurement made at miscellaneous sections above gauge.

_n Measurement made at miscellaneous sections below gauge.

_c Gauge height affected by backwater from ice on control.

_w Weir measurement

DAILY GAUGE HEIGHT AND DISCHARGE of Sixmile coulee at Spangler's ranch, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.				13.00 ^e	3.03	13.2	2.73	7.5	4.76	74.0
2.			3.20	12.60	2.98	12.0	2.75	7.8	4.38	53.0
3.			2.96	8.00	2.81	8.6	2.71	7.1	4.15	42.0
4.			2.76	4.20	2.84	9.0	2.73	7.5	3.94	34.0
5.			2.68	2.70	2.83	8.4	2.70	6.9	3.94	34.0
6.			2.69	2.90	2.81	7.8	2.68	6.5	4.28	48.0
7.			2.71	3.30	2.74	5.3	2.67	6.3	4.24	46.0
8.			2.58	0.82	2.66	4.6	2.67	6.3	4.01	36.0
9.			2.87	6.30	2.76	6.9	2.66	6.1	3.75	28.0
10.			4.89	69.00	2.76	7.1	2.67	6.3	3.68	26.0
11.			5.76	122.00	2.75	7.3	2.67	6.3	4.14	42.0
12.			5.33	96.00	2.73	7.3	2.68	5.0	5.23	102.0
13.			4.96	74.00	2.67	6.3	2.59	4.8	4.73	72.0
14.			4.55	52.00	2.74	8.0	2.59	4.8	4.33	50.0
15.			4.35	42.00	2.67	7.1	2.62	5.4	4.03	37.0
16.	6.51	167.0 ^s	4.45	46.00	2.65	6.9	2.63	5.6	3.91	33.0
17.	6.38	159.0	4.36	42.00	2.64	7.1	2.64	5.8	3.75	28.0
18.	6.21	149.0	4.17	35.00	2.68	8.0	2.64	5.8	3.61	25.0
19.	6.05	139.0	4.06	31.00	2.64	7.5 ^s	2.62	5.4	3.47	22.0
20.	5.89	129.0	4.27	39.00	2.75	7.8	2.59	4.8	3.32	18.9
21.	5.67	116.0	4.23	37.00	2.74	7.7	2.59	4.8	3.21	16.7
22.	5.27	92.0	3.90	27.00	2.71	7.1	2.58	4.6	3.22	16.9
23.	4.93	72.0	3.69	22.00	2.70	6.9	2.64	5.8	3.57	24.0
24.	4.71	60.0	3.22	13.00	2.68	6.5	2.69	6.7	3.58	24.0
25.	4.47	48.0	3.22	13.00	2.68	6.5	2.72	7.3	3.47	22.0
26.	4.29	40.0	3.17	12.00	2.65	6.0	2.77	8.2	3.32	18.9
27.	3.99	29.0	3.65	22.00	2.65	6.0	4.04	38.0	3.24	17.3
28.	3.47	17.9	3.41	17.50	2.65	6.0	4.23	46.0	3.12	14.9
29.	3.26	13.7	3.19	13.90	2.66	6.1	4.29	48.0	3.10	14.5
30.			3.09	12.80	2.67	6.3	4.99	87.0	3.26	17.7
31.			3.03	12.40			5.16	98.0		

s-s Shifting conditions.

e Discharge estimated.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Sixmile coulee at Spangler's ranch, for 1916—*Concluded*

DAY	July		August		September		October		November	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	3.17	15.9	2.63	5.6	2.47	2.5	2.54	3.9	2.58	4.60
2	3.10	14.5	2.61	5.2	2.46	2.3	2.56	4.2	2.60	5.00
3	3.14	15.3	2.57	4.4	2.45	2.2	2.60	5.0	2.62	5.40
4	3.24	17.3	2.55	4.0	2.55	4.0	2.62	5.4	2.64	5.80
5	3.13	15.1	2.56	4.2	2.55	4.0	2.65	6.0	2.64	5.80
6	3.03	13.2	2.55	4.0	2.55	4.0	2.58	4.6	2.60	5.00
7	2.98	12.2	2.54	3.9	2.55	4.0	2.64	5.8	2.58	4.60
8	3.10	14.5	2.53	3.7	2.54	3.9	2.58	4.6	2.55	4.00
9	3.40	20.0	2.61	5.2	2.54	3.9	2.95	11.6	2.53	3.70
10	3.08	14.1	2.95	11.6	2.53	3.7	2.94	11.5	2.42	1.58
11	2.92	11.1	2.75	7.8	2.53	3.7	2.90	10.7	2.39	1.01x
12	2.81	9.0	2.85	9.8	2.51	3.3	2.86	9.9		
13	2.75	7.8	2.84	9.6	2.53	3.7	2.80	8.8		
14	2.70	6.9	2.77	8.2	2.54	3.9	2.79	8.6		
15	2.65	6.0	2.74	7.7	2.54	3.9	2.76	8.0		
16	2.64	5.8	2.72	7.3	2.53	3.7	2.74	7.7		
17	2.65	6.0	2.68	6.5	2.53	3.7	2.70	6.9		
18	2.72	7.3	2.75	7.8	2.51	3.3	2.66	6.1		
19	2.63	5.6	2.67	6.3	2.50	3.1	2.62	5.4		
20	2.64	5.8	2.63	5.6	2.50	3.1	2.59	4.8		
21	2.63	5.6	2.60	5.0	2.49	2.9	2.65	6.0		
22	2.62	5.4	2.57	4.4	2.49	2.9	2.69	6.7		
23	2.60	5.0	2.55	4.0	2.48	2.7	2.69	6.7		
24	2.57	4.4	2.54	3.9	2.48	2.7	2.68	6.5		
25	2.53	3.7	2.55	4.0	2.48	2.7	2.68	6.5		
26	2.80	8.8	2.55	4.0	2.48	2.7	2.67	6.3		
27	2.75	7.8	2.55	4.0	2.46	2.3	2.67	6.3		
28	2.74	7.7	2.52	3.5	2.54	3.9	2.65	6.0		
29	2.67	6.3	2.51	3.3	2.55	4.0	2.60	5.0		
30	2.66	6.1	2.51	3.3	2.54	3.9	2.60	5.0		
31	2.65	6.0	2.49	2.9			2.60	5.0		

x Records discontinued; creek still running about 1 second-feet.

MONTHLY DISCHARGE of Sixmile coulee at Spangler's ranch, for 1916

(Drainage area 42 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (16-29)	167.0	13.70	88.0	2.100	1.09	2,443
March	122.0	0.82	29.0	0.690	0.80	1,783
April	13.2	4.60	7.4	0.176	0.20	440
May	98.0	4.60	15.4	0.367	0.42	947
June	102.0	14.50	35.0	0.833	0.93	2,083
July	20.0	3.70	9.4	0.224	0.26	578
August	11.6	2.90	5.5	0.131	0.15	338
September	4.0	2.20	3.4	0.081	0.09	202
October	11.6	3.90	6.6	0.157	0.18	406
November (1-11)	5.8	1.01	4.2	0.100	0.04	92
The period					4.16	9,312

WOOD AND ANDERSON DITCH NEAR COULEE

Location.—On the NE. $\frac{1}{4}$ Sec. 21, Tp. 7, Rge. 29, W. 3rd Mer., about 150 miles West of ranch house.

Records available.—For the irrigation season of 1915 and 1916.

Gauge.—Vertical staff; zero of gauge maintained at 95.67 feet during 1916. Zero elevation maintained at 94.62 feet during 1915.

Bench-mark.—Permanent iron bench-mark on right bank established 1916; assumed elevation 100.00 feet. Relative elevation of former wooden stake bench-mark 97.82 feet.

Artificial control.—A permanent twenty-four-inch, sharp-crested, rectangular weir, located ten feet below the gauge, controls the flow at this station; elevation of crest maintained at 96.67 feet during 1916.

Discharge measurements.—Made with weir.

Observer.—D. Wood.

Remarks.—Six visits were made during 1916, but there was no flow at time of each visit, and it is understood that no water was diverted during 1916.

WOOD AND ANDERSON NORTH DITCH FROM WHITE MUD COULEE

(Reported as West ditch near Coulee in 1915)

Location.—On the NE. $\frac{1}{4}$ Sec. 22, Tp. 7, Rge. 29, W. 3rd Mer., three hundred and seventy-five feet below intake of ditch.

Records available.—No water was used during irrigation seasons of 1914, 1915 and 1916.

Gauge.—Vertical staff; elevation of zero maintained at 97.36 feet since establishment of station.

Bench-mark.—Permanent iron bench-mark established in 1916 on the left bank; assumed elevation 100.00 feet. Relative elevation of former wooden stake bench-mark 99.82 feet.

Artificial control.—A twenty-four inch, sharp-crested weir controls the flow at this station and is located ten feet below the gauge; the elevation of the crest was maintained at 98.17 feet during 1916.

Discharge measurements.—Made with weir.

Observer.—D. Wood.

Remarks.—Six visits were made during the season, but there was no flow at time of each visit.

WOOD AND ANDERSON SOUTH DITCH FROM WHITE MUD COULEE

(Reported as East Ditch near Coulee in 1915)

Location.—On the SE. $\frac{1}{4}$ Sec. 22, Tp. 7, Rge. 29, W. 3rd Mer.

Records available.—For the irrigation season of 1915 and 1916.

Gauge.—Vertical staff; zero elevation of gauge maintained at 96.83 feet since establishment.

Bench-mark.—Permanent iron bench-mark on the right bank; assumed elevation 100.00 feet. Relative elevation of wooden stake B.M. reported in 1915 99.67 feet.

Channel.—Composed of clay and gravel.

Discharge measurements.—Made by measuring head over thirty-six-inch, sharp-crested, rectangular weir which is permanently located ten feet below the gauge.

Artificial control.—Thirty-six-inch, sharp-crested, rectangular weir, located ten feet below gauge. Elevation of crest of weir maintained during 1916 at 98.76 feet.

Observer.—D. Wood.

Remarks.—Six visits were made during 1916, but there was no flow at time of each visit.

F. L. MULL WEST DITCH NEAR COULEE

Location.—On the NW. $\frac{1}{4}$ Sec. 24, Tp. 7, Rge. 29, W. 3rd Mer., about 900 feet below dam and intake.

Records available.—During the irrigation seasons of 1915-1916.

Gauge.—Vertical staff driven into the bed of ditch near left bank. Elevation of zero of gauge maintained at 96.02 since establishment.

Bench-mark.—Top of iron post located on the right bank near gauge; assumed elevation 100.00 feet.

Channel.—Composed of sand and gravel.

Discharge measurements.—Made by measuring the head over permanent sharp-crested weir, located ten feet below gauge; elevation of crest of weir maintained at 96.90 feet.

Observer.—Fred Mull.

Remarks.—Six visits were made to this station during 1916, but there was no flow at time of each visit, and it is understood that no water was diverted during 1916.

SESSIONAL PAPER No. 25a

F. L. MULL EAST DITCH NEAR COULEE

Location.—On the NW. $\frac{1}{4}$ Sec. 24, Tp. 7, Rge. 29, W. 3rd Mer., about 800 feet below dam and intake of irrigation ditch.

Records available.—For the irrigation seasons of 1915 and 1916, during which no water was used.

Gauge.—Vertical staff. Zero of gauge maintained at 98.53 feet since establishment.

Bench-mark.—Top of iron post on the right bank near gauge and ten feet up stream from permanent weir.

Channel.—Composed of sand and gravel.

Discharge measurements.—Made by measuring the head on permanent twenty-four-inch weir, located ten feet below gauge.

Observer.—Fred Mull.

Remarks.—Six visits were made to this station during 1916, but there was no flow at time of each visit, and it is understood that no water was diverted during 1916.

J. E. PARSONAGE DITCH NEAR BATTLE CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 3, Tp. 7, Rge. 29, W. 3rd Mer., about 70 feet up stream from bridge on road allowance between Tps. 6 and 7, Rge. 29.

Gauge.—Vertical staff driven into bed of ditch about ten feet up stream from permanent weir. Zero of gauge maintained at 95.86 feet.

Bench-mark.—Top of three-quarter-inch iron post, on right bank, 15 feet from gauge; assumed elevation 100.00 feet.

Channel.—Composed of sand and gravel.

Discharge measurements.—Made by measuring the head over crest of permanent sharp-crested, twenty-four-inch, rectangular weir. Elevation of crest of weir maintained at 96.96 feet.

Observer.—J. E. Parsonage.

Remarks.—Six visits were made during 1916, but there was no flow at time of each visit, and it is understood that no water was used during 1916.

LINDNER DITCH FROM BATTLE CREEK

Location.—On the NW. $\frac{1}{4}$ Sec. 10, Tp. 6, Rge. 29, W. 3rd Mer., near Tenmile Police Detachment.

Records available.—For the irrigation seasons of 1910-1916.

Gauge.—Vertical staff. Zero elevation of gauge maintained at 95.84 feet during 1915; zero elevation of gauge maintained at 90.36 feet during 1916.

Bench-mark.—A permanent iron bench-mark, located near intake headgate; assumed elevation 100.00 feet.

Channel.—Composed of gravel and clay loam.

Discharge measurements.—Made with a forty-three-inch weir which is permanently installed in the ditch.

Observer.—J. B. Lindner.

Remarks.—This is a weir station consisting of a forty-two-inch, sharp-crested weir, with complete end contractions. The elevation of the crest of the weir was kept at a gauge height of 1.04 feet during 1914-16. Nine visits were made during 1916, but there was no flow at the time of each visit.

DAILY GAUGE HEIGHT AND DISCHARGE of Lindner ditch from Battle creek, for 1916

APRIL			MAY			JULY		
Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>
17	1.61h	4.80	6	1.96h	9.7	14	1.36h	2.1
18	1.61	4.80	7	1.96	9.7	15	1.46	3.1
19	1.61	4.80	8	1.96	9.7	16	1.46	3.1
20	1.61	4.80	9	1.96h	9.7	17	1.46	3.1
21	1.61	4.80				18	1.46h	3.1
22	1.61	4.80						
23	1.61	4.80						
24	1.61	4.80						
25	1.06h	0.03						

h Headgate open from April 17 to April 25, May 6 to May 9, and July 14 to July 18.

MONTHLY DISCHARGE of Lindner ditch from Battle creek, for 1916

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April (17-25).....	4.8	0.03	4.3			77
May (6-9).....	9.7	9.70	9.7			77
June.....						
July (14-18).....	3.1	2.10	2.9			29
The period.....						183

BATTLE CREEK AT TENMILE POLICE DETACHMENT

Location.—On the NE. $\frac{1}{4}$ Sec. 33, Tp. 5, Rge. 29, W. 3rd Mer., at the highway bridge, about one-quarter mile south of Tenmile R.N.W.M.P. Detachment, and 300 yards north of the new Battle Creek post office.

Records available.—Open water flow from June 3, 1909, to October 31, 1916.

Gauge.—Chain gauge fastened to the guard rail, on the downstream side of bridge. Zero of gauge maintained at 86.97 feet. Length of chain (from marker to bottom of weight) 19.10 feet, during 1909-10. Zero of gauge maintained at 86.87 feet. Length of chain 19.10 feet during 1911. Zero of gauge maintained at 86.84 feet. Length of chain 19.11 feet during 1912-16.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Practically permanent, but might shift during extreme floods. Weeds in the channel affect the gauge heights at times, during mid-summer season.

Discharge measurements.—Made from downstream side of bridge during high water and by wading or with weir some distance below during low-water flow.

Winter flow.—Station discontinued during winter season.

Diversions.—Lindner Brothers divert water for irrigation about two miles above. There are several large beaver dams above this station which have a tendency to keep the creek running at this point after the creek goes dry farther up towards its source in the Cypress hills.

Observers.—Tom Bell, March 10 to June 1; Hugh Thomas, June 2 to October 31.

Accuracy.—Stage—discharge relation slightly shifting during period July 18 to October 31, caused by growth of vegetation in stream control.

Rating curve well defined between 50 and 1,000 second-feet. Gauge read to hundredths once daily during normal stages, twice daily during high fluctuating stages. Daily discharge ascertained by applying mean daily gauge heights to rating table from March 10 to July 17; by Bolster method July 18 to October 31.

Remarks.—At gauge height 11.24 feet. Battle creek overflowed its banks about 1,000 feet up stream, and a small quantity of water drained off into Middle creek.

SESSIONAL PAPER No. 25b

DISCHARGE MEASUREMENTS of Battle creek at Tenmile police detachment, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 23	P. A. Fetterly	43	69.7	2.00	4.57	139 _n
Mar. 27	do	45	66.0	2.00	4.42	132 _n
Mar. 31	do	42	46.0	1.60	3.68	74 _n
April 4	do	38	39.7	1.34	3.41	53 _n
April 7	do	41	46.1	1.36	3.50	63 _n
April 11	do	40	47.7	1.77	3.83	85 _n
April 14	do	41	43.9	1.74	3.73	77 _n
April 25	do	39	33.4	1.50	3.21	50 _n
May 11	H. W. Rowley	38	35.6	1.40	3.30	50 _n
May 28	do	43	183.0	1.63	6.16	298
May 29	do	46	221.0	1.76	6.94	388
May 30	do	66	347.0	2.04	9.19	707
May 31	do	72	477.0	2.03	11.14	967
June 23	do	44	71.9	2.20	4.78	158 _n
June 26	do	43	56.3	1.85	4.06	104 _n
July 18	do	39	37.8	1.38	3.42	52 _n
Aug. 9	do	38	36.8	1.45	3.56	53 _n
Aug. 29	do	37	29.3	1.36	3.41	40 _n
Sept. 23	do	37	29.5	1.19	3.36	35 _n
Oct. 10	do	39	38.7	1.49	3.69	58 _n
Nov. 12	do	36	39.6	0.63	3.30	23 _n

i Ice conditions at gauge.*n* Discharge measured at miscellaneous section below the gauge.

DAILY GAUGE HEIGHT AND DISCHARGE of Battle creek at Tenmile police detachment, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1			3.60	70	3.23	48	7.08	406
2			3.61	71	3.44	60	6.00	280
3			4.00	98	3.37	56	5.40	216
4			3.78	83	3.30	52	5.00	178
5			3.90	91	3.38	57	4.75	156
6			3.80	84	3.31	53	7.76	492
7			3.95	94	3.13	42	5.73	250
8			3.74	80	3.29	51	5.45	221
9			3.59	69	3.31	53	4.75	156
10	8.16	545	3.69	76	3.32	53	4.60	144
11	11.10	975	3.90	91	3.39	57	5.70	247
12	11.10	975	3.88	90	3.32	53	9.01	664
13	10.10	825	3.73	79	3.27	50	6.66	355
14	7.16	415	3.67	75	3.28	51	5.63	239
15	6.16	298	3.71	78	3.33	54	5.12	189
16	6.22	304	3.57	68	3.28	51	4.84	164
17	6.35	318	3.48	63	3.27	50	4.60	144
18	5.70	247	3.43	60	3.24	48	4.36	125
19	5.22	198	3.39	57	3.22	47	4.11	106
20	4.40	128	3.37	56	3.33	54	5.30	206
21	5.32	208	3.41	59	3.22	47	4.04	101
22	4.60	144	3.34	54	3.27	50	4.07	103
23	4.30	120	3.22	47	3.34	54	4.78	158
24	3.80	84	3.18	45	3.69	76	4.50	136
25	4.22	114	3.15	43	4.20	112	4.92	171
26	3.58	69	3.21	47	4.56	141	4.09	104
27	4.10	105	3.29	51	5.65	242	4.04	101
28	4.08	104	3.29	51	6.45	330	4.00	98
29	4.00	98	3.33	54	7.01	397	4.00	98
30	3.50	64	3.31	53	8.25	558	4.07	103
31	3.73	79			11.13	980		

DAILY GAUGE HEIGHT AND DISCHARGE of Battle creek at Tennile police detachment, for 1916
—Concluded

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	4.14	108	3.57	57	3.42	40	3.50	45
2.....	3.84	87	3.39	46	3.46	43	3.54	47
3.....	4.05	102	3.37	44	3.44	41	3.59	48
4.....	4.74	155	3.62	60	3.59	49	3.63	52
5.....	4.32	122	3.56	56	3.70	56	3.73	60
6.....	4.00	98	3.54	53	3.68	55	3.65	55
7.....	3.80	84	3.39	43	3.62	51	3.75	61
8.....	3.76	81	3.38	42	3.52	46	3.70	57
9.....	3.90	91	3.56	53	3.43	41	3.60	50
10.....	3.95	94	4.48	49	3.52	46	3.70	57
11.....	3.57	68	4.09	89	3.46	42	3.66	54
12.....	3.46	62	3.87	73	3.42	40	3.78	63
13.....	3.53	66	3.74	64	3.42	40	3.78	63
14.....	3.37	56	3.66	60	3.49	43	3.74	60
15.....	3.43	60	3.58	54	3.52	46	3.74	60
16.....	3.37	56	3.52	51	3.46	42	3.71	58
17.....	3.30	52	3.48	48	3.41	39	3.64	54
18.....	3.43	60s	3.55	53	3.37	36	3.64	54
19.....	3.96	88	3.81	69	3.39	38	3.60	50
20.....	3.56	62	3.63	56	3.43	41	3.57	48
21.....	3.47	56	3.54	50	3.36	38	3.60	50
22.....	3.44	52	3.51	48	3.43	41	3.65	54
23.....	3.41	49	3.44	44	3.37	37	3.68	56
24.....	3.38	47	3.42	42	3.37	37	3.56	48
25.....	3.43	50	3.45	45	3.41	39	3.58	48
26.....	3.80	73	3.55	48	3.43	41	3.55	47
27.....	4.00	87	3.51	46	3.43	41	3.57	48
28.....	4.26	106	3.45	42	3.52	46	3.60	50
29.....	3.85	77	3.37	38	3.52	46	3.56	47
30.....	3.65	61	3.36	37	3.48	42	3.58	48
31.....	3.56	56	3.42	40	.....	.....	3.60	50s

s-s Shifting conditions.

MONTHLY DISCHARGE of Battle creek at Tennile police detachment, for 1916
(Drainage area 210 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (10-31).....	975	64	292	1.390	1.14	12,739
April.....	98	43	68	0.324	0.36	4,046
May.....	980	42	130	0.619	0.71	7,993
June.....	664	98	204	0.971	1.08	12,139
July.....	155	47	76	0.362	0.42	4,673
August.....	89	37	52	0.248	0.29	3,197
September.....	56	36	43	0.205	0.23	2,559
October.....	63	45	53	0.252	0.29	3,259
The period.....	.....	.....	.....	.....	4.52	50,605

SESSIONAL PAPER No. 25b

MONTHLY DISCHARGE in Second-feet of Battle creek at Tenmile police detachment

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		11.3		37.0	24.0	11.40	26	39	53	29	1,774
November		12.0 _j		33.0 _c	23.0 _e						
December											
January											
February											
March						24.00 _f	59 _g	292 _h			
April			85.0 _b	269.0 _d	213.0	111.00	109	68		125	7,453
May			51.0	88.0	60.0	34.00	40	130		67	4,122
June	68.0 _a		25.0	43.0	25.0	19.40	82	204		67	3,949
July	37.0		19.1	24.0	17.3	2.70	45	76		32	1,943
August	12.6		14.0	17.7	8.8	1.80	27	52		19	1,176
September	7.8		86.0	19.6	6.1	9.40	30	43		29	1,714
Total in acre-ft. . .	6,503	999	13,413	29,349	21,959	12,163	23,532	49,744			22,131

a 3-19 and 26-30.

b 21-30.

c 1-7.

d 3-30.

e 1-15.

f 16-31.

g 16-31.

h 10-31.

j 1-13.

MARSHALL AND GAFF DITCH FROM BATTLE CREEK

Location.—On the NE. $\frac{1}{4}$ Sec. 33, Tp. 5, Rge. 29, W. 3rd Mer., about two hundred and fifty feet below headgate of ditch.

Records available.—During the irrigation seasons of 1914 and 1915 no water was used by Mrs. Marshall and no daily gauge height records were kept. Records at a point three miles below are given under Gaff ditch. No water used during 1916 season.

Gauge.—Vertical staff driven into the bed of the ditch near the right bank; zero elevation of gauge maintained at 95.02 feet during 1915 and 1916.

Bench-mark.—Permanent iron bench-mark located near the log control of the left bank; assumed elevation 100.00 feet.

Artificial control.—A permanent log control was constructed August 9, 1915, fifty feet below the gauge rod.

Discharge measurements.—Made with meter or weir.

Observer.—Mrs. L. A. Marshall.

Remarks.—Nine visits were made to this station during 1916, but there was no flow at time of each visit, and it is understood that no water was diverted during 1916.

GAFF DITCH FROM BATTLE CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 25, Tp. 5, Rge. 29, W. 3rd Mer.

Records available.—For the irrigation seasons of 1912-16.

Gauge.—Vertical staff. The zero elevation of the gauge was maintained at 96.18 feet during 1912 and to October 2, 1915. On October 2, 1915, a new staff gauge was installed, the zero elevation of which is 95.95 feet.

Bench-mark.—A permanent iron bench-mark was set on June 25, 1915, on the section line between sections 25 and 26, about twenty feet north of the ditch; assumed elevation 100.00 feet. Elevation of old B.M. stake as referred to iron B.M., 99.22 feet.

Channel.—Composed of sandy loam.

Discharge measurements.—Made with current-meter by wading or with a weir.

Artificial control.—A log control was built twenty feet below the gauge on October 2, 1915.

Observer.—W. D. Gaff.

Remarks.—Three visits were made to this station during 1916, but there was no flow at time of each visit, and it is understood that no water was diverted during 1916.

F. W. HENRY DITCH FROM BATTLE CREEK

Location.—On the NW. $\frac{1}{4}$ Sec. 28, Tp. 5, Rge. 28, W. 3rd Mer., near Battle Creek.

Records available.—For the irrigation seasons of 1915 and 1916.

Gauge.—Vertical staff; zero of gauge maintained at 97.97 feet during 1915-16.

Bench-mark.—Permanent iron bench-mark; assumed elevation 109.00 feet.

Discharge measurements.—Made with a five-foot weir permanently located twenty feet below gauge; elevation of crest maintained at 98.52 feet.

Observer.—F. W. Henry.

Remarks.—There was no flow at each of five visits during 1916, and it is understood that no water was diverted during 1916.

HENRY DITCH FROM HALFWAY COULEE

Location.—On the NW. $\frac{1}{4}$ Sec. 34, Tp. 5, Rge. 28, W. 3rd Mer., near Battle Creek.

Records available.—For the irrigation seasons of 1915-1916.

Gauge.—Vertical staff; zero elevation of gauge maintained at 96.49 feet since establishment.

Discharge measurements.—Made with a twenty-four-inch sharp-crested rectangular weir, permanently set in the ditch ten feet below the gauge. Crest maintained at elevation of 97.66 feet.

Observer.—F. W. Henry.

DISCHARGE MEASUREMENTS of Henry ditch from Halfway coulee, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 25.....	P. A. Fetterley.....					Nil
April 27.....	H. W. Rowley.....				1.27	0.21 ^b
June 26.....	do.....					Nil
Aug. 11.....	do.....					"
Aug. 31.....	do.....					"
Sept. 26.....	V. A. Newhall and H. W. Rowley.....					"

^b Discharge determined by using a twenty-four-inch weir.

DAILY GAUGE HEIGHT AND DISCHARGE of Henry ditch from Halfway coulee, for 1916

APRIL			APRIL			MAY		
Day	Gauge Height	Discharge	Day	Gauge Height	Discharge	Day	Gauge Height	Discharge
	<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>
19	1.40 ^h	0.72	25	1.25	0.15	1	1.27	0.21
20	1.35	0.50	26	1.25	0.15	2	1.26	0.18
21	1.35	0.50	27	1.27	0.21	3	1.26	0.18
22	1.34	0.46	28	1.27	0.21	4	1.25	0.15
23	1.30	0.31	29	1.25	0.15	5	1.25	0.15
24	1.25	0.15	30	1.25	0.15	6	1.25 ^h	0.15

^h Headgate, open April 19 to May 6.

MONTHLY DISCHARGE of Henry ditch from Halfway coulee, for 1916

MONTH	DISCHARGE IN SECOND-Feet				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April (19-30).....	0.72	0.15	0.30	.....	.....	7
May (1-6).....	0.21	0.15	0.17	.....	.....	2
The period.....						9

SESSIONAL PAPER No. 25B

WILSON DITCH FROM BATTLE CREEK

Location.—On the NE. $\frac{1}{4}$ Sec. 34, Tp. 5, Rge. 28, W. 3rd Mer.

Records available.—Discharge measurements only in 1914. No water used during 1915-16.

Gauge.—Plain staff; zero elevation of gauge 96.28 feet.

Bench-mark.—Permanent iron bench-mark on left bank; assumed elevation 100.00 feet.

Remarks.—Four visits were made during 1916, but there was no flow at time of each visit.

WILKES DITCH FROM BATTLE CREEK

Location.—On the NW. $\frac{1}{4}$ Sec. 4, Tp. 6, Rge. 27, W. 3rd Mer., one and one-half miles below intake of ditch.

Gauge.—Vertical staff fastened to post driven three feet into bed of ditch near left bank. Zero of gauge maintained at 97.98 feet.

Bench-mark.—Permanent iron bench-mark on left bank, six feet from edge of ditch; assumed elevation 100.00 feet.

Discharge measurements.—Made with a current-meter or with a weir.

Observer.—W. L. Wilkes.

Remarks.—Six visits were made during 1916 and there was no flow at time of each visit.

BATTLE CREEK AT WILKES' RANCH

Location.—On the NW. $\frac{1}{4}$ Sec. 33, Tp. 5, Rge. 27, W. 3rd Mer., at R. W. Wilkes' ranch, twelve miles east of the Tenmile R.N.W.M.P. Detachment.

Records available.—Open water flow from May 1, 1912, to October 31, 1916. From July, 1910, to November 7, 1911, a station was maintained at W. S. Wilson's ranch, six miles up stream.

Gauge.—Vertical staff. Zero of gauge maintained at 89.86 feet during 1912; zero of gauge maintained at 90.01 feet during 1913-16.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet, located on the left bank 750 feet below the gauge.

Channel.—Composed of sand and slightly shifting.

Discharge measurements.—Made by wading.

Winter flow.—Station discontinued during winter season.

Diversions.—Water is diverted above this station for irrigation purposes, by Mrs. L. A. Marshall, J. A. Gaff, Lindner Brothers, W. S. Wilson and F. W. Henry.

Observer.—Mrs. Bertha Wilkes.

Accuracy.—Stage discharge relation practically permanent, affected by ice and shifting bed of stream during April and May.

Rating curve very well defined between 35 and 575 second-feet. Gauge read to hundredths at least once daily. Gauge heights considered reliable after May 12; before this date somewhat questionable.

Daily discharge ascertained by applying mean daily gauge heights to rating table from May 25 to October 31; from March 25 to May 24 obtained by the Bolster method.

Results considered good from May 12 to end of season; other results fair.

DISCHARGE MEASUREMENTS of Battle creek at Wilkes' ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 3	P. A. Fetterley	49	52.8	1.75	4.42	101
April 6	do	46	36.0	1.21	3.48	43
April 13	do	45	92.0	1.12	3.10	103
April 28	H. W. Rowley	27	22.7	2.51	2.48	57 ⁿ
May 12	do	48	43.8	1.12	2.43	59 ⁿ
June 1	do	58	237.0	2.39	5.65	566 ⁿ
June 2	do	53	157.0	2.26	4.54	356 ⁿ
June 27	do	47	84.2	1.28	2.80	108 ⁿ
July 20	do	48	73.6	1.21	2.58	89 ⁿ
Aug. 12	do	46	67.4	1.20	2.50	81 ⁿ
Aug. 31	do	45	48.6	0.82	2.09	40 ⁿ
Sept. 27	Newhall and Rowley	44	48.6	0.78	2.05	38 ⁿ
Nov. 13	H. W. Rowley	47	38.5	0.57	2.34	22 ⁿ

ⁿ Discharge measured at miscellaneous section below gauge.

ⁱ Stream frozen over; measurement made under ice.

7 GEORGE V. A. 1917

DAILY GAUGE HEIGHT AND DISCHARGE of Battle creek at Wilkes' ranch, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1			4.44	103	2.42	52	6.44	726
2			4.27	86	2.58	69	3.92	257
3			4.42	101 <i>d</i>	2.62	73	3.15	152
4			4.29	100	2.68	79	3.30	171
5			4.27	111	2.64	75	3.79	238
6			3.48	43 <i>d</i>	2.55	67	4.11	286
7			4.16	127	2.55	67	4.26	310
8			3.79	102	2.51	64	4.51	351
9			3.18	55	2.49	62	5.02	445
10			3.03	56	2.45	61	5.23	485
11			3.03	68	2.42	58	5.76	590
12			3.03	63	2.43	59	5.86	610
13			3.10	103 <i>d</i>	2.43	61	5.55	548
14			3.27	123	2.38	58	4.61	368
15			3.22	120	2.38	59	4.00	269
16			3.11	109	2.35	57	3.65	218
17			3.08	106	2.35	58	3.48	194
18			2.97	96	2.35	59	3.40	184
19			2.73	72	2.35	60	3.22	161
20			2.68	69	2.28	54	2.97	129
21			2.60	63	2.28	55	2.83	113
22			2.60	64	2.30	58	2.85	115
23			2.61	65	2.30	57	3.06	140
24			2.54	60	2.30	59	3.08	143
25	6.05	324 <i>s</i>	2.46	54	2.78	108 <i>s</i>	3.08	143
26	5.83	289	2.36	46	3.08	143	2.99	131
27	5.63	258	2.31	42	3.48	194	2.80	109
28	5.57	249	2.48	57 <i>d</i>	3.86	248	2.66	95
29	5.19	197	2.12	27	4.38	329	2.74	103
30	4.87	155	2.36	47	5.02	445	2.76	105
31	4.68	131			6.09	656		

d Actual measurement.*s-s* Shifting conditions.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Battle creek at Wilkes' ranch, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.	2.36	65	2.30	59	2.03	35	2.10	41
2.	2.29	58	2.30	59	2.08	39	2.15	45
3.	2.43	72	2.18	47	2.17	47	2.15	45
4.	2.97	129	2.18	47	2.30	59	2.25	54
5.	3.06	140	2.18	47	2.22	51	2.28	57
6.	2.86	116	2.20	59	2.22	51	2.30	59
7.	2.86	116	2.17	47	2.22	51	2.32	61
8.	2.86	116	2.14	44	2.18	47	2.35	64
9.	2.82	111	2.10	41	2.23	52	2.35	64
10.	2.64	93	2.41	70	2.28	57	2.37	66
11.	2.64	93	2.70	99	2.28	57	2.40	69
12.	2.64	93	2.51	80	2.20	49	2.38	67
13.	2.64	93	2.46	75	2.32	61	2.35	64
14.	2.46	75	2.28	57	2.14	44	2.34	63
15.	2.36	65	2.28	57	2.14	44	2.34	63
16.	2.25	54	2.28	57	2.07	39	2.29	58
17.	2.20	59	2.25	54	2.05	37	2.28	57
18.	2.35	64	2.28	57	2.08	39	2.29	58
19.	2.65	94	2.33	62	2.04	39	2.29	58
20.	2.58	87	2.26	55	2.03	35	2.30	59
21.	2.47	76	2.15	45	2.03	35	2.30	59
22.	2.24	53	2.15	45	2.03	38	2.27	56
23.	2.18	47	2.15	45	2.10	41	2.26	55
24.	2.12	43	2.11	42	2.10	41	2.24	53
25.	2.08	39	2.11	42	2.10	41	2.26	55
26.	2.20	49	2.11	42	2.20	49	2.26	55
27.	2.60	89	2.11	42	2.05	37	2.26	55
28.	2.82	111	2.07	39	2.05	37	2.26	55
29.	2.96	128	2.16	46	2.09	40	2.28	57
30.	2.72	101	2.12	43	2.15	45	2.15	45
31.	2.52	81	2.07	39	.....	.....	2.26	55

MONTHLY DISCHARGE of Battle creek at Wilkes' ranch, for 1916

(Drainage area 310 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (25-31)	324	39	229	0.739	1.92	3,179
April	127	39	79	0.255	0.28	4,701
May	656	35	116	0.374	0.43	7,133
June	726	41	263	0.848	0.95	15,650
July	140	39	84	0.271	0.31	5,165
August	99	39	53	0.171	0.20	3,259
September	61	35	45	0.145	0.16	2,678
October	69	41	57	0.184	0.21	3,505
The period	.....	.....	.....	.....	4.46	45,270

GILCHRIST BROTHERS' DITCH FROM BATTLE CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 11, Tp. 5, Rge. 27, W. 3rd Mer., at the intake of Gilchrist Brothers' ditch near Consul.

Records available.—For the irrigation seasons of 1914-1916.

Gauge.—Vertical staff; the zero of the gauge has been maintained at 95.81 feet since establishment.

Bench-mark.—Permanent iron bench-mark located on the right bank near the gauge; assumed elevation 100.00 feet.

Discharge measurements.—Made with a current-meter in the flume, or with a weir just below the flume.

Observer.—W. F. Gilchrist.

Remarks.—Four visits were made during 1916, but there was no flow at time of each visit, and it is understood that no water was diverted during 1916.

RICHARDSON DITCH FROM BATTLE CREEK

Location.—On the SE. $\frac{1}{4}$ Sec. 2, Tp. 5, Rge. 27, W. 3rd Mer., near Consul.

Records available.—October 14, 1911, to October 31, 1916.

Gauge.—Vertical staff. The zero of the gauge has been maintained at 97.03 feet since establishment.

Bench-mark.—Permanent iron bench-mark located on the left bank of the ditch at the gauge; assumed elevation 100.00 feet.

Channel.—Composed of clay loam and overgrown with grass.

Discharge measurements.—Made with a current-meter or with a weir.

Observer.—L. E. Richardson.

Remarks.—There was no flow at each of the visits of the district engineer during 1916, and it is understood that no water was diverted during 1916.

J. MCKINNON DITCH FROM BATTLE CREEK

Location.—On the NW. $\frac{1}{4}$ Sec. 20, Tp. 4, Rge. 26, W. 3rd Mer., near Consul.

Records available.—No water has been used since station was established.

Gauge.—Vertical staff driven into bed of ditch near the left bank; elevation of zero maintained at 96.07 feet during 1915.

Bench-mark.—During 1915 a permanent iron bench-mark was installed two feet east of the old wooden bench-mark; assumed elevation 100.00 feet.

Discharge measurements.—Made with current-meter or weir.

Artificial control.—The lateral gate near the station will affect the flow at the gauge.

Observer.—James McKinnon.

Remarks.—Seven visits were made to this station during 1916 but there was no flow at time of each visit, and it is understood that no water was diverted during 1916.

STIRLING AND NASH DITCH FROM BATTLE CREEK

Location.—On the SE. $\frac{1}{4}$ Sec. 22, Tp. 3, Rge. 27, W. 3rd Mer., at R. J. Stirling's ranch, near Consul.

Records available.—This station was established July 11, 1911. The ditch was used from July 11 to August 17, 1911; from July 3 to August 20, 1912; and from June 28 to July 19, 1913. But sufficient discharge measurements were not made during 1911-13 to estimate the daily discharge; the only daily discharge records available are for 1914-1916.

Gauge.—Vertical staff. Zero elevation of the gauge has been maintained at 94.43 feet since establishment.

Bench-mark.—A permanent iron bench-mark on the right bank; assumed elevation 100.00 feet.

Channel.—Uniform and in good condition.

Discharge measurements.—Made with current-meter or with a weir.

Artificial control.—On May 21, 1915, a control was constructed thirty feet below the gauge consisting of plank piling, driven, end to end, at right angles to ditch, with surface outline about eight inches above the contour of ditch.

Observer.—R. J. Stirling.

SESSIONAL PAPER No. 25b

DISCHARGE MEASUREMENTS of Stirling and Nash ditch from Battle creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 29.....	H. W. Rowley.....				Dry	Nil
May 13.....	do.....				Dry	Nil
June 30.....	do.....	11	10.8	0.54	1.81	5.80
July 21.....	do.....				Dry	Nil
Aug. 14.....	do.....				"	"
Sept. 1.....	do.....				"	"
Sept. 28.....	V. A. Newhall and H. W. Rowley.....				"	"
Nov. 14.....	H. W. Rowley.....				"	"

DAILY GAUGE HEIGHT AND DISCHARGE of Stirling and Nash ditch from Battle creek, for 1916

JUNE			JULY			JULY		
Day	Gauge Height	Discharge	Day	Gauge Height	Discharge	Day	Gauge Height	Discharge
	<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>
27	1.68h	4.2	1	1.36	1.50	10	1.72h	4.70
28	1.83	6.1	2	1.32	1.20	11	1.71x	4.60
29	1.81	5.8	3	1.46	2.20	12	1.57	3.10
30	1.76	5.2	4	1.67	4.10	13	1.36	1.50
.....	.....	.....	5	1.73	4.80	14	1.23	0.76
.....	.....	.....	6	1.73	4.80	15	0.99	Nil
.....	.....	.....	7	1.73	4.80	16	0.77	"
.....	.....	.....	8	1.73	4.80	17	1.52	2.60
.....	.....	.....	9	1.73	4.80	18	1.72x	4.70

h Headgate open from June 27 to July 10.

x Local run-off July 11-18.

MONTHLY DISCHARGE of Stirling and Nash ditch from Battle creek, for 1916

MONTH	DISCHARGE IN SECOND-FeET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
June (27-30).....	6.1	4.2	5.3	.....	.....	42
July (1-18).....	4.8	Nil	3.1	.....	.....	111
The period.....	.....	.....	.....	.....	.....	153

BATTLE CREEK AT NASH'S RANCH

Location.—On the NE. $\frac{1}{4}$ Sec. 3, Tp. 3, Rge. 27, W. 3rd Mer., at E. R. Nash's ranch (Nashlyn post office).

Records available.—Open water flow from May 11, 1910, to October 31, 1916.

Gauge.—Vertical staff; elevation of zero maintained at 90.23 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Slightly shifting.

Discharge measurements.—Made from highway bridge, one-quarter mile below gauge, by wading 200 feet below gauge or with weir, depending on stage of stream.

Winter flow.—Station discontinued during winter season.

Diversions.—Water is diverted for irrigation by Jas. McKinnon, Jr., Mrs. S. J. Richardson, Gilchrist brothers, Stirling and Nash, and L. E. Richardson, between this station and the station at Wilkes' ranch.

Observer.—E. R. Nash.

Accuracy.—Stage—discharge relation practically permanent, affected by ice during short periods in February and March while ice was going out.

Rating curve well defined between 35 second-feet and 700 second-feet. Above this and during period February 27 to March 14, records are subject to small error. Gauge read to hundredths daily, twice daily during fluctuating flood stages. Daily discharge ascertained by applying mean daily gauge heights to rating table.

Results very good except for period of break-up.

DISCHARGE MEASUREMENTS of Battle creek at Nash's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 31.....	H. W. Rowley.....	58.0	232.0	2.98	5.77	691 _n
April 3.....	do.....	31.3	114.0	2.59	3.46	295 _n
April 10.....	do.....	35.0	60.2	2.18	1.99	131 _n
April 14.....	do.....	35.0	55.4	2.11	1.83	117 _n
May 1.....	do.....	33.0	34.5	1.94	1.31	67 _n
May 13.....	do.....	38.0	41.8	1.53	1.29	64 _n
June 3.....	do.....	35.7	148.0	2.59	3.95	383 _n
June 30.....	do.....	43.0	62.0	1.81	1.90	112 _n
July 21.....	do.....	43.0	62.6	1.80	1.87	113 _n
Aug. 14.....	do.....	40.0	42.9	1.63	1.39	70 _n
Sept. 1.....	do.....	37.0	32.0	1.22	1.10	39 _n
Sept. 28.....	do.....	35.5	32.9	1.18	1.04	39 _n
Oct. 25.....	do.....	37.0	39.5	1.37	1.24	54 _n
Nov. 14.....	do.....	35.0	28.8	0.90	1.32	26 _n

_i Creek frozen over.

_n Discharge measured at miscellaneous section below gauge.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Battle creek at Nash's ranch, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			3.70	332	4.95	532	1.30	60	5.42	622
2.....			3.93	364	4.15	398	1.30	60	6.18	774
3.....			4.04	381	3.48	303	1.25	56	3.79	345
4.....			4.00	375	2.93	234	1.32	62	3.25	374
5.....			3.96	369	2.59	195	1.35	65	2.95	236
6.....			3.74	338	2.36	170	1.35	65	2.25	158
7.....			3.96	369	2.34	167	1.27	57	2.45	180
8.....			3.60	319	1.97	127	1.30	60	3.65	326
9.....			3.64	324	1.74	104	1.22	53	3.00	242
10.....			3.65	326	1.97	127	1.25	56	2.72	209
11.....			3.35	286	1.95	125	1.25	56	2.45	180
12.....			3.40	293	1.92	122	1.32	62	2.45	180
13.....			5.14	568	1.94	124	1.27	57	4.05	382
14.....			10.94	1,726	1.90	120	1.25	56	4.95	532
15.....			9.96	1,530	1.80	110	1.25	56	3.60	319
16.....			8.92	1,322	1.78	108	1.25	56	3.02	244
17.....			7.08	954	1.79	109	1.25	56	2.70	207
18.....			7.14	966	1.75	105	1.25	56	2.45	180
19.....			6.60	858	1.67	97	1.22	53	2.25	158
20.....			6.27	792	1.55	85	1.20	51	2.15	146
21.....			6.31	800	1.50	80	1.17	48	2.02	132
22.....			6.35	808	1.52	82	1.18	49	2.00	130
23.....			8.23	1,184	1.40	70	1.15	46	2.05	136
24.....			7.48	1,034	1.36	66	1.14	46	2.02	132
25.....			6.15	768	1.34	64	1.26	56	2.40	174
26.....			6.03	744	1.30	60	1.90	120	2.15	146
27.....	4.50	454	7.79	1,096	1.27	57	2.35	168	1.94	124
28.....	4.60	470	8.98	1,334	1.26	56	2.66	203	1.82	112
29.....	4.08	387	8.43	1,224	1.25	56	3.00	242	1.73	103
30.....			6.97	932	1.25	56	3.69	331	1.90	120
31.....			5.90	718			4.52	457		

DAILY GAUGE HEIGHT AND DISCHARGE of Battle creek at Nash's ranch, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	2.00	130	1.35	65	1.10	42	1.05	38
2.....	2.04	134	1.30	60	1.10	42	1.07	39
3.....	1.85	115	1.26	56	1.12	44	1.15	46
4.....	1.80	110	1.17	48	1.18	49	1.22	53
5.....	1.80	110	1.15	46	1.20	51	1.30	60
6.....	2.15	146	1.15	46	1.25	56	1.34	64
7.....	1.90	120	1.15	46	1.21	52	1.36	66
8.....	1.73	103	1.15	46	1.32	62	1.30	60
9.....	1.70	100	1.35	65	1.22	53	1.34	64
10.....	1.65	95	1.29	59	1.18	49	1.33	63
11.....	1.60	90	1.25	56	1.15	46	1.25	56
12.....	1.65	95	1.75	105	1.15	46	1.25	56
13.....	1.50	80	1.60	90	1.12	44	1.22	53
14.....	1.42	72	1.45	75	1.15	46	1.30	60
15.....	1.35	65	1.36	66	1.16	47	1.34	64
16.....	1.30	60	1.28	58	1.16	47	1.34	64
17.....	2.40	174	1.25	56	1.16	47	1.28	58
18.....	3.80	346	1.24	55	1.15	46	1.25	56
19.....	1.70	100	1.23	54	1.15	46	1.25	56
20.....	1.60	90	1.18	49	1.15	46	1.23	54
21.....	2.00	130	1.35	65	1.14	46	1.23	54
22.....	1.65	95	1.28	58	1.05	38	1.21	52
23.....	1.40	70	1.21	52	1.06	39	1.23	54
24.....	1.35	65	1.26	56	1.05	38	1.25	56
25.....	1.23	54	1.26	56	1.05	38	1.24	55
26.....	1.15	46	1.20	51	1.05	38	1.24	55
27.....	1.23	54	1.15	46	1.05	38	1.23	54
28.....	1.18	49	1.15	46	1.04	37	1.23	54
29.....	1.20	51	1.21	52	1.05	38	1.23	54
30.....	2.02	132	1.19	50	1.05	38	1.22	53
31.....	1.60	90	1.15	46	.....	.....	1.22	53

MONTHLY DISCHARGE of Battle creek at Nash's ranch, for 1916

(Drainage area 500 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (27-29).....	470	387	437	0.874	0.10	2,600
March.....	1,726	286	756	1.510	1.74	46,485
April.....	532	56	137	0.274	0.31	8,152
May.....	457	46	94	0.188	0.22	5,780
June.....	774	103	243	0.486	0.54	14,460
July.....	346	46	102	0.204	0.24	6,272
August.....	105	46	57	0.114	0.13	3,505
September.....	62	37	45	0.090	0.10	2,678
October.....	66	38	56	0.112	0.13	3,443
The period.....	.....	.....	.....	.....	3.51	93,375

SESSIONAL PAPER No. 25a

MEAN MONTHLY DISCHARGE of Battle creek at Nash's ranch

(Area of Watershed, 500 square miles)
(Average Run-off per square mile, 96.9 acre-ft.)

YEAR	Feb. Sec.-ft.	Mar. Sec.-ft.	April Sec.-ft.	May Sec.-ft.	June Sec.-ft.	July Sec.-ft.	Aug. Sec.-ft.	Sept. Sec.-ft.	Oct. Sec.-ft.	Nov. Sec.-ft.	Total Acre-ft.
1910....				14a	2.6	0.9a	1.3a	5	4	14b	2,406a
1911....			104	46	11.0	9.0	10.0	118	38	47b	21,498
1912....			612c	90	37.0	8.0	11.0	17	24		38,030
1913....			339	55	13.0	21.0	9.0	5	12		27,290
1914....		25b	142	26	1.0	0.0	0.0	3	17		12,830
1915....		80b	230	36	87.0	52.0	25.0	25	28		33,925
1916....	437a	756	137	94	243.0	102.0	57.0	45	56		93,375
Average Sec.-ft.		287	261	58	56	32	19	31	26	30	37,825
Average acre-ft.		17,647	15,531	3,566	3,332	1,968	1,168	1,845	1,599	1,785	48,441

a Records incomplete; omitted from average.

b Reduced to monthly average.

c Estimated monthly average.

NOTE:—High discharge for 1911 and 1913 computed from slope measurements.

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Battle creek drainage basin, in 1916

Date	Engineer	Stream	Location	Width	Area of Section	Mean Velocity	Discharge
				<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
Aug. 11..	H. W. Rowley...	Sixmile creek	Sec. 12-8-29-3...	5	7.15	1.55	11.10
May 11..	do	Tennile creek	Sec. 4-6-29-3...				0.49w
May 31..	do	do	do	9	10.80	1.13	12.20
June 26..	do	do	do				0.50w
July 18..	do	do	do				0.43w
Aug. 9..	do	do	do				0.50w
Aug. 29..	do	do	do				0.19w
Sept. 23..	do	do	do				Nil
Oct. 10..	do	do	do				

w Discharge determined by using a weir.

FRENCHMAN RIVER DRAINAGE BASIN

General Description

Frenchman river drains a large portion of Southwestern Saskatchewan. It rises in Cypress lake in Township 6, Range 26, West of the 3rd Meridian, and follows a southeasterly course for some 150 miles, crossing into the United States in Range 10, West of 3rd Meridian. It eventually finds its way into Milk river near Saco, Montana, U.S.A., and therefore forms a part of the general drainage basin of the Missouri.

Cypress lake is on the southern slope of Cypress hills at an elevation of about 3,155 feet above sea-level. It occupies what is probably a portion of an abandoned water course or channel of an ancient river, which joined Battle creek to the Frenchman river. The water of the lake is fresh and is supplied by a number of coulees and small streams which head in the hills in the north. The largest of these are Oxarart and Sucker creeks, both of which have a small continuous flow.

During dry years Cypress lake does not overflow, and the whole discharge of the Frenchman river is derived from Belanger, Davis and Fairwell creeks and the north branch. From Township 6, Range 23, West of the 3rd Meridian, where the north branch joins the main stream, there is no appreciable increase in the flow of the river while in Canada. Mule creek, which joins the river in Township 5, Range 17, West of 3rd Meridian, and Snake creek, in Township 3, Range 13, West of 3rd Meridian, however, have small flows.

The country surrounding Cypress lake is of rolling prairie much broken by coulees. In many

of these there is considerable tree growth, but for the most part the country is devoid of all vegetation other than grasses. All the streams in the upper section of the drainage basin, with the exception of the north branch, rise on the plateau at the top of the hills. Flowing southward they break through deep, well-wooded gorges before reaching the lower flats along the river. The north branch, however, is in a deep valley throughout its entire length. Its feeders, like the western tributaries of the main stream, cut from the bench to the valley in deep, well-wooded coulees. Below the mouth of the north branch there is little tree growth. Here and there along the river may be found small growths of shrubs and maple, while up on the hillsides in some of the coulees there are small clumps of poplar covering about an acre. Most of these coulees are rapidly becoming cleared by the settlers who are taking up the bench lands above the river valley. The benches are well covered with grasses, but the hills and sides of the valley are almost devoid of all vegetation. In the flats along the river, except where irrigated, the chief vegetation consists of sage brush and cactus.

When the Frenchman leaves the lake, it flows through a wide flat valley as far as the mouth of Fairwell creek; most of this land is under proposed or constructed irrigation ditches. Below this point the valley becomes more broken and narrows considerably, while the side hills become higher. Small portions of this bottom will no doubt be brought under irrigation, but as yet little has been done in that direction. Below the junction of the north branch, the valley becomes rough and rugged, the sides being cut with buttes and deep coulees. Here numerous outcroppings of lignite may be seen and also a deep seam of light-coloured clay and sand. This seam, which has been bleached almost a pure white, shows at many points along the river's entire course and is one of the most conspicuous objects in this region. From its colour and nature the river receives its local name of the "Whitemud."

At East End, some miles lower down, the valley again widens out into flats. Here is located the largest irrigation project in the Cypress Hills district. Mr. J. C. Strong has a large dam in the river and a system of ditches and storage reservoirs, which irrigate a large part of the flat. Directly above this project there are two smaller irrigation schemes and just below Messrs. Morrison Brothers have a dam and ditch which will irrigate a large area. Their ditch is carried across the river and continued by Messrs. Duncan and Watson who irrigate another large area.

Below the East End flat none of the flats, which occur at various points along the river, are irrigated as yet. A short distance below the mouth of Snake creek the river enters bad lands which continue into the United States.

On most of the tributary streams above East End and on some below that point there are irrigation schemes covering areas of various sizes.

The mean annual rainfall of this basin is not well established, but it is estimated that it would range from 12 to 16 inches, most of which falls in May, June and July. From November to April the streams are frozen over and usually there is an abundant snowfall.

The construction of the Weyburn-Lethbridge branch of the Canadian Pacific Railway, through the upper part of the valley, has opened up that part of the drainage basin, and grain growing is increasing.

MAPLE CREEK CATTLE COMPANY DITCH FROM OXARART CREEK

Location.—On the NE. $\frac{1}{4}$ Sec. 20, Tp. 6, Rge. 27, W. 3rd Mer., 600 feet below intake of ditch.

Records available.—June 27 to close of 1916 season.

Gauge.—Vertical staff fastened to post driven into bed of ditch near left bank; zero of gauge maintained at 3,183.37 feet.

Bench-mark.—Permanent iron bench-mark located at gauging station on Oxarart creek at Wylie's ranch; elevation 3,203.75 feet above mean sea-level. (Irrigation surveys.)

Artificial control.—Thirty-six-inch, rectangular, sharp-crested weir located six feet below gauge; elevation of crest 3,184.37 feet.

Observer.—Mrs. R. Wylie.

Remarks.—There was no discharge at each of the six visits of the district engineer during 1916.

SESSIONAL PAPER No. 25a

DAILY GAUGE HEIGHT AND DISCHARGE of Maple Creek Cattle Company ditch from Oxarart creek, for 1916

JUNE			JULY		
Day	Gauge Height	Discharge	Day	Gauge Height	Discharge
	<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>
27	1.10x	0.31	1	1.12	0.39
28	1.10	0.31	2	1.11	0.36
29	1.10	0.31	3	1.12	0.39
30	1.12	0.39	4	1.14	0.52
			5	1.13	0.47
			6	1.12	0.39
			7	1.10	0.31
			8	1.10	0.31

x Station established, June 27, 1916.

h Headgate closed July 9 to close of season.

MONTHLY DISCHARGE of Maple Creek Cattle Company ditch from Oxarart creek, for 1916

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
June (27-30x).....	0.39	0.31	0.33			3
July (1-8).....	0.52	0.31	0.39			6
The period.....						9

x Station established, June 27, 1916.

OXARART CREEK AT WYLIE'S RANCH

Location.—On the NE. $\frac{1}{4}$ Sec. 20, Tp. 6, Rge. 27, W. 3rd Mer., at Joseph Wylie's ranch.*Records available.*—The open water seasons, beginning June 15, 1909, to November 11, 1916.*Gauge.*—Vertical staff; zero of gauge maintained at 3,199.02 feet during 1909-10, at 3,199.06 feet during 1911, and at 3,199.03 feet during 1912 and to April 27, 1916. On April 28, 1916, the gauge was moved five hundred feet down stream and the zero of the gauge maintained at 3,186.60 feet balance of season.*Bench-mark.*—Permanent iron bench-mark located on the right bank at original location of gauge; elevation 3,203.75 feet above mean sea-level (Irrigation Surveys).*Discharge measurements.*—Made with current-meter, by wading at miscellaneous section, or with weir during very low stages.*Winter flow.*—Station is not maintained during winter season.*Artificial control.*—The thirty-six-inch weir established August 5, 1915, was carried away early in the spring of 1916 by ice and was not replaced.*Accuracy.*—Stage-discharge relation; affected by ice and floods in February and March; April 28 to close of season, permanent. Rating curve well defined from 1.30 to 32 second-feet. Gauge read to hundredths twice daily during fluctuating stages; otherwise once daily. Daily discharge ascertained from rating curve by applying corrections for shifting conditions, March 25 to 31 and April 3 to 8; estimated April 1-2; by applying mean daily gauge heights to rating tables, March 5 to 24 and April 9 to November 11.*Observer.*—Robert Gordon.*Remarks.*—Creek broke up about February 15, but no gauge heights recorded until March 5. Records discontinued November 11, although small flow in creek.

DISCHARGE MEASUREMENTS of Oxarart creek at Wylie's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 24.....	P. A. Fetterley.....	18.0	16.20	0.77	1.24	12.40 _m
Mar. 25.....	do.....	18.0	25.30	1.83	1.81	46.00 _m
April 3.....	do.....	18.0	15.80	0.72	1.01	11.40 _m
April 8.....	do.....	17.5	11.20	0.86	0.93	4.10 _m
April 12.....	do.....	17.7	17.60	1.02	1.36	17.80 _m
April 28.....	H. W. Rowley.....	12.0	4.60	0.91	0.70	4.20 _m
May 12.....	do.....	11.0	4.10	0.76	0.67	3.10 _m
June 1.....	do.....	13.0	9.60	2.08	1.04	20.00 _n
June 27.....	do.....	12.0	5.60	1.27	0.78	7.10
July 20.....	do.....	12.0	4.00	0.82	0.68	3.30 _n
Aug. 12.....	do.....	11.0	4.10	0.68	0.65	2.80 _n
Aug. 31.....	do.....	12.0	3.80	0.58	0.60	2.20 _n
Sept. 27.....	V. A. Newhall and H. W. Rowley.....	11.0	3.20	0.39	0.56	1.26 _n
Nov. 13.....	H. W. Rowley.....				0.61	1.30 _w

m Discharge was measured at miscellaneous sections above gauge.

n Discharge was measured at miscellaneous sections below the gauge.

w Discharge determined by using a 36-inch weir.

DAILY GAUGE HEIGHT AND DISCHARGE of Oxarart creek at Wylie's ranch, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			0.51	2.5 _e	0.70	4.0	1.04	20.0
2.....			0.31	2.5 _e	0.70	4.0	1.01	18.3
3.....			1.36	29.0	0.70	4.0	0.96	15.7
4.....			1.36	28.0	0.70	4.0	0.90	12.7
5.....	1.11	8.3	0.96	8.0	0.70	4.0	0.95	15.2
6.....	1.11	8.3	0.96	7.0	0.70	4.0	1.21	30.0
7.....	1.11	8.3	1.09	9.2 _s	0.70	4.0	1.02	18.8
8.....	1.61	33.0	1.11	8.3	0.70	4.0	0.93	14.2
9.....	2.21	75.0	1.06	7.0	0.70	4.0	0.86	10.8
10.....	2.16	71.0	1.09	7.8	0.70	4.0	0.92	13.7
11.....	3.06	134.0	1.16	9.7	0.70	4.0	1.05	20.0
12.....	1.81	47.0	1.21	11.3	0.68	3.5	1.18	28.0
13.....	2.31	82.0	1.33	16.4	0.68	3.5	1.25	32.0
14.....	1.91	54.0	1.41	21.0	0.66	3.0	1.08	22.0
15.....	1.51	26.0	1.33	16.4	0.65	2.7	0.98	16.8
16.....	1.36	17.9	1.23	12.0	0.65	2.7	0.92	13.7
17.....	1.66	36.0	1.13	8.8	0.65	2.7	0.89	12.2
18.....	1.06	7.0	1.31	15.5	0.65	2.7	0.86	10.8
19.....	1.03	6.3	1.16	9.7	0.65	2.7	0.82	8.9
20.....	1.23	12.0	1.01	5.8	0.65	2.7	0.80	8.0
21.....	1.82	47.0	1.05	6.8	0.65	2.7	0.80	8.0
22.....	1.87	51.0	1.02	6.1	0.65	2.7	0.84	9.8
23.....	1.86	50.0	1.00	5.6	0.64	2.5	0.90	12.7
24.....	1.47	24.0	1.05	6.8	0.64	2.5	0.89	12.2
25.....	1.46	23.0	1.00	5.6	0.65	2.7	0.84	9.8
26.....	1.36	19.7 _s	0.90	3.5	0.85	10.3	0.78	7.1
27.....	1.46	27.0	0.85	2.6	1.05	20.0	0.78	7.1
28.....	1.46	29.0	0.70	4.0 _x	0.95	15.2	0.77	6.7
29.....	1.41	28.0	0.70	4.0	0.97	16.2	0.78	7.1
30.....	1.13	14.5	0.70	4.0	1.02	18.8	0.84	9.8
31.....	0.81	5.3			1.04	20.0		

_e Discharge estimated.

_s Shifting conditions.

_x New station established 500 feet down stream.

SESSIONAL PAPER No. 25a

DAILY GAUGE HEIGHT AND DISCHARGE of Oxarart creek at Wylie's ranch, for 1916.—*Concluded.*

DAY	July		August		September		October		November	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	0.85	10.3	0.68	3.50	0.60	1.90	0.56	1.42	0.55	1.30
2.....	0.84	9.8	0.65	2.70	0.60	1.90	0.57	1.54	0.55	1.30
3.....	0.84	9.8	0.65	2.70	0.59	1.78	0.58	1.66	0.55	1.30
4.....	0.86	10.8	0.65	2.70	0.60	1.90	0.58	1.66	0.55	1.30
5.....	0.84	9.8	0.65	2.70	0.60	1.90	0.57	1.54	0.54	1.22
6.....	0.80	8.0	0.65	2.70	0.60	1.90	0.58	1.66	0.54	1.22
7.....	0.76	6.2	0.65	2.70	0.60	1.90	0.60	1.90	0.54	1.22
8.....	0.75	5.8	0.65	2.70	0.60	1.90	0.60	1.90	0.54	1.22
9.....	0.75	5.8	0.66	3.00	0.60	1.90	0.59	1.78	0.54	1.22
10.....	0.75	5.8	0.66	3.00	0.60	1.90	0.58	1.66	0.54	1.22
11.....	0.74	5.4	0.65	2.70	0.59	1.78	0.57	1.54	0.54	1.22
12.....	0.72	4.7	0.65	2.70	0.59	1.78	0.56	1.42	.....	.....
13.....	0.72	4.7	0.65	2.70	0.59	1.78	0.56	1.42	.....	.....
14.....	0.72	4.7	0.65	2.70	0.59	1.78	0.56	1.42	.....	.....
15.....	0.71	4.4	0.65	2.70	0.59	1.78	0.56	1.42	.....	.....
16.....	0.68	3.5	0.65	2.70	0.59	1.78	0.55	1.30	.....	.....
17.....	0.68	3.5	0.64	2.50	0.59	1.78	0.55	1.30	.....	.....
18.....	0.68	3.5	0.63	2.40	0.60	1.90	0.55	1.30	.....	.....
19.....	0.70	4.0	0.63	2.40	0.63	2.40	0.55	1.30	.....	.....
20.....	0.70	4.0	0.63	2.40	0.67	3.20	0.55	1.30	.....	.....
21.....	0.70	4.0	0.63	2.40	0.67	3.20	0.56	1.42	.....	.....
22.....	0.70	4.0	0.63	2.40	0.67	3.20	0.56	1.42	.....	.....
23.....	0.70	4.0	0.63	2.40	0.66	3.00	0.56	1.42	.....	.....
24.....	0.70	4.0	0.63	2.40	0.66	3.00	0.56	1.42	.....	.....
25.....	0.80	8.0	0.63	2.40	0.66	3.00	0.56	1.42	.....	.....
26.....	0.90	12.7	0.63	2.40	0.67	3.20	0.56	1.42	.....	.....
27.....	1.10	23.0	.....	2.30e	0.56	1.42	0.56	1.42	.....	.....
28.....	0.90	12.7	.....	2.20e	0.56	1.42	0.55	1.30	.....	.....
29.....	0.80	8.0	.....	2.10e	0.56	1.42	0.55	1.30	.....	.....
30.....	0.72	4.7	.....	2.00e	0.56	1.42	0.55	1.30	.....	.....
31.....	0.70	4.0	0.60	1.90	.....	.....	0.55	1.30	.....	.....

e Discharge estimated.

MONTHLY DISCHARGE of Oxarart creek at Wylie's ranch, for 1916

(Drainage area 77 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (5-31).....	134.00	5.30	35.00	0.450	0.46	1,873
April.....	29.00	2.50	9.50	0.123	0.14	565
May.....	20.00	2.50	5.90	0.077	0.09	363
June.....	32.00	6.70	14.40	0.187	0.21	857
July.....	23.00	3.50	6.90	0.080	0.10	424
August.....	3.50	1.90	2.60	0.034	0.04	160
September.....	3.20	1.42	2.10	0.027	0.03	125
October.....	1.90	1.30	1.47	0.019	0.02	90
November (1-11).....	1.30	1.22	1.25	0.016	0.01	27
The period.....	.....	.....	.....	.....	1.10	4,484

MEAN MONTHLY DISCHARGE in Second-feet of Oxarart creek at Wylie's ranch

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		1.93	0.68	0.80	0.54	0.76	0.86	4.30	1.47	1.42	87
Nov.....		1.31 ^b		0.80 ^c	0.41 ^e				1.25 ^k		
Dec.....											
January.....											
February.....											
March.....						0.55 ^f	6.00 ^g	35.00 ^h			
April.....		5.40	12.40	87.00 ^d	27.00	7.60	16.70	9.50		13.10	785
May.....		2.50	4.10	8.00	4.60	3.00	6.10	5.90		4.90	300
June.....		1.50	2.20	4.60	4.50	2.30	5.10	14.40		4.90	295
July.....		4.70 ^a	0.84	1.50	1.83	0.76	3.80	6.90		2.50	156
August.....		3.50 ^a	0.71	0.90	1.14	0.52	2.80	2.60		1.66	102
Sept.....		2.10	0.70	1.60	1.10	0.35	4.10	2.10		1.60	95
Total in Acre-feet	402	866	1,403	5,047	2,472	922	2,483	4,631			1,820

^a 19-31.^b 1-16.^c 1-15.^d 8-30.^e 1-15.^f 28-31.^g 23-31.^h 5-31.^k 1-11.

SUCKER CREEK AT GILCHRIST'S RANCH

Location.—On the NW. $\frac{1}{4}$ Sec. 24, Tp. 6, Rge. 26, W. 3 Mer.*Records available.*—May 25, 1909, to November 9, 1916.*Gauge.*—Vertical staff. Elevation of the zero of the present gauge has been maintained at 3,191.11 feet since April 1912. Elevation of the old gauge, two hundred feet below, was 3,189.20 feet.*Bench-mark.*—Permanent iron bench-mark. Elevation 3,196.25 feet above mean sea-level. (Irrigation Surveys.)*Channel.*—Slightly shifting.*Discharge measurements.*—Made by current-meter and weir in low stages.*Winter flow.*—This station is not maintained during winter.*Observer.*—J. D. Gilchrist.

DISCHARGE MEASUREMENTS of Sucker creek at Gilchrist's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 6.....	M. H. French.....	8.5	4.65	1.89	1.12	8.8
May 11.....	J. E. Caughey.....	6.7	4.07	0.88	1.01	3.6
June 10.....	do.....	8.0	8.70	1.62	1.20	14.1
July 12.....	do.....	7.3	4.26	0.50	0.99	3.6
Oct. 24.....	L. P. B. Miles.....	8.0	3.00	1.89	1.09	5.7

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Sucker creek at Gilchrist's ranch, for 1916

Day	April		May		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	1.29	21.0	1.17	12.0	1.30	22.00	1.00	3.6
2.....	1.20	14.1	1.06	5.8	1.20	14.10	1.20	14.1
3.....	1.20	14.1	1.17	12.0	1.00	3.60	1.20	14.1
4.....	1.18	12.7	1.27	19.6	1.30	22.00	1.00	3.6
5.....	1.15	10.6	1.17	12.0	2.00	78.00	1.00	3.6
6.....	1.14	10.0	1.07	6.3	1.60	46.00	1.00	3.6
7.....	1.14	10.0	1.07	6.3	1.30	22.00	1.80	62.0
8.....	1.14	10.0	1.05	5.4	1.00	3.60	1.20	14.1
9.....	1.15	10.6	1.06	5.8	0.98	3.10	1.10	7.6
10.....	1.30	22.0	1.06	5.8	1.40	30.00	1.00	3.6
11.....	1.35	26.0	1.40	30.0	1.30	22.00	1.00	3.6
12.....	1.38	28.0	1.20	14.1	1.00	3.60	0.98	3.1
13.....	1.24	17.2	1.10	7.6	0.99	3.30	0.98	3.1
14.....	1.30	22.0	1.00	3.6	1.40	30.00	0.96	2.5
15.....	1.28	20.0	1.10	7.6	1.20	14.10	0.97	2.8
16.....	1.28	20.0	1.10	7.6	1.10	7.60	0.97	2.8
17.....	1.15	10.6	1.30	22.0	1.40	30.00	1.20	14.1
18.....	1.29	21.0	1.10	7.6	1.50	38.00	1.10	7.6
19.....	1.20	14.1	0.99	3.3	1.30	22.00	1.00	3.6
20.....	1.15	10.6	0.98	3.1	1.40	30.00	1.00	3.6
21.....	1.12	8.8	1.20	14.1	1.60	46.00	0.98	3.1
22.....	1.11	8.2	1.10	7.6	2.00	78.00	0.96	2.5
23.....	1.10	7.6	1.10	7.6	1.80	62.00	0.95	2.3
24.....	1.09	7.2	1.15	10.6	1.00	3.60	0.97	2.8
25.....	1.07	6.3	1.30	22.0	1.00	3.60	0.97	2.8
26.....	1.06	5.8	1.35	26.0	0.86	0.77	0.97	2.8
27.....	1.06	5.8	1.78	60.0	1.20	14.10	0.95	2.3
28.....	1.07	6.3	1.65	50.0	1.00	3.60	0.95	2.3
29.....	1.06	5.8	1.64	49.0	1.40	30.00	0.96	2.5
30.....	1.16	11.3	2.00	78.0	1.00	3.60	1.10	7.6
31.....			1.50	38.0			1.00	3.6

DAILY GAUGE HEIGHT AND DISCHARGE OF Sucker creek at Gilchrist's ranch, for 1916—*Concluded*

DAY	August		September		October		November	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	1.00	3.60	0.89	1.17	1.30	22.0	0.94	2.1
2.....	0.96	2.50	0.90	1.30	1.40	30.0	0.94	2.1
3.....	0.96	2.50	0.90	1.30	1.60	46.0	0.95	2.3
4.....	0.94	2.10	0.87	0.90	1.06	5.8	0.95	2.3
5.....	0.94	2.10	0.88	1.14	1.07	6.3	0.95	2.3
6.....	0.96	2.50	0.89	1.17	1.09	7.2	0.94	2.1
7.....	0.93	1.88	0.89	1.17	1.08	6.7	0.94	2.1
8.....	0.87	0.90	0.89	1.17	1.08	6.7	0.94	2.1
9.....	0.86	0.77	0.86	0.77	1.07	6.3	0.95	2.3
10.....	0.89	1.17	0.96	2.50	1.03	4.7		
11.....	0.89	1.17	0.96	2.50	1.10	7.6		
12.....	0.89	1.17	0.97	2.80	1.16	11.3		
13.....	0.87	0.90	0.96	2.50	1.12	8.8		
14.....	0.89	1.17	0.97	2.80	1.12	8.8		
15.....	0.90	1.30	0.97	2.80	1.12	8.8		
16.....	0.90	1.30	0.97	2.80	1.11	8.2		
17.....	0.89	1.17	0.97	2.80	1.09	7.2		
18.....	0.90	1.30	0.96	2.50	1.07	6.3		
19.....	0.87	0.90	0.96	2.50	1.05	5.4		
20.....	0.86	0.77	0.96	2.50	1.03	4.7		
21.....	0.87	0.90	0.98	3.10	1.03	4.7		
22.....	0.86	0.77	0.98	3.10	1.03	4.7		
23.....	0.86	0.77	0.98	3.10	1.01	4.0		
24.....	0.89	1.17	0.98	3.10	1.01	4.0		
25.....	0.88	1.04	0.98	3.10	0.97	2.8		
26.....	0.87	0.90	0.98	3.10	0.97	2.8		
27.....	0.89	1.17	1.00	3.60	0.96	2.5		
28.....	0.89	1.17	1.20	14.10	0.96	2.5		
29.....	0.89	1.17	1.20	14.10	0.95	2.3		
30.....	0.86	0.77	1.20	14.10	0.95	2.3		
31.....	0.86	0.77			0.95	2.3		

MONTHLY DISCHARGE of Sucker creek at Gilchrist's ranch, for 1916

(Drainage area 30 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April.....	28.0	5.80	13.30	0.443	0.49	791
May.....	78.0	3.10	18.10	0.603	0.70	1,113
June.....	78.0	0.77	23.00	0.767	0.86	1,369
July.....	62.0	2.30	6.80	0.227	0.26	418
August.....	3.6	0.77	1.35	0.045	0.05	83
September.....	14.1	0.77	3.50	0.117	0.13	205
October.....	46.0	2.30	8.20	0.273	0.31	504
November (1-9).....	2.3	2.10	2.20	0.073	0.02	39
The period.....					2.82	4,522

SESSIONAL PAPER NO. 25a

MEAN MONTHLY DISCHARGE in Second-feet of Sucker creek at Gilchrist's ranch

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		2.50	2.30	3.00	3.50	2.20	3.0	4.30	8.2	3.60	222
November.....				3.00 ^d	3.40 ^e				2.2 ^h		
December.....											
January.....											
February.....											
March.....			16.40 ^c			13.80 ^f	6.0 ^g				
April.....		5.20	26.00	107.00	52.00	24.00	16.7	13.30		35.00	2,081
May.....	6.30 ^a	2.50	5.80	11.50	7.40	5.10	6.1	18.10		8.10	497
June.....	14.20 ^b	1.40	3.70	3.20	2.80	2.30	5.1	23.00		5.90	353
July.....	11.50	0.73	1.40	2.10	1.89	0.36	3.8	6.80		3.60	219
August.....		1.58	1.40	2.50	1.36	0.35	2.8	1.35		1.57	97
September.....	2.03	2.10	3.90	3.20	1.57	1.17	4.1	3.50		2.70	160
Total in acre-ft....	1,780	970	2,789	7,979	4,351	2,584	2,613	4,243			3,629

a 25-31.

b 1-19—22-30.

c 26-31.

d 1.

e 1-15.

f 15-31.

g 23-31.

h 1-9.

This station was originally at Whitcomb and Zeigler's ranch.

FRENCHMAN RIVER NEAR BELANGER

Location.—On the SE. $\frac{1}{4}$ Sec. 19, Tp. 6, Rge. 25, W. 3rd Mer., near Belanger post office.*Records available.*—From June 12 to October 31, 1916.*Gauge.*—Vertical enamel staff on left bank; zero elevation of gauge 3,150.90 feet above sea-level.*Bench-mark.*—Wooden plug in ground about 50 feet from gauge on left bank; elevation of bench-mark 3,154.60 feet above sea-level (Canadian Irrigation Surveys).*Channel.*—Gravel, likely to shift in high water.*Discharge measurements.*—By wading with current-meter, or with weir. During high water at bridge three-quarter mile up stream.*Winter flow.*—Observations discontinued during winter months.*Observer.*—Jos. Drury.

DISCHARGE MEASUREMENTS of Frenchman river near Belanger, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 11.....	J. E. Caughey.....	9.0	5.20	1.96	.....x	10.2
June 10.....	do.....	11.0	9.65	1.30	.....x	12.5
July 12.....	do.....	13.0	10.10	0.79	1.27	8.0
Sept. 2.....	L. B. P. Miles.....	12.6	5.90	0.59	0.85	3.5
Oct. 24.....	do.....	10.0	3.35	1.41	0.48	4.7

x No gauge.

DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman river near Belanger, for 1916

DAY	June		July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			2.17	22.0	1.25	7.7	0.95	4.5	1.26	7.8
2.....			2.12	21.0	1.20	7.1	0.85	3.6	1.29	8.2
3.....			2.07	20.0	1.20	7.1	0.85	3.6	1.32	8.5
4.....			2.07	20.0	1.18	6.9	0.86	3.7	1.25	7.8
5.....			1.99	18.9	1.18	6.9	0.86	3.7	1.20	7.3
6.....			1.97	18.6	1.17	6.7	0.89	3.9	1.25	7.8
7.....			1.88	16.9	1.17	6.7	0.90	4.0	1.30	8.3
8.....			1.67	13.5	1.19	7.0	0.93	4.3	1.30	8.3
9.....			1.62	12.7	1.24	7.6	0.95	4.5	1.27	8.0
10.....			1.57	12.0	1.23	7.5	0.90	4.0	1.24	7.7
11.....			1.37	9.2	1.20	7.1	0.85	3.6	1.19	7.2
12.....	3.82	59	1.27	7.9	1.19	7.0	0.84	3.5	1.15	6.9
13.....	3.83	60	1.26	7.8	1.17	6.7	0.84	3.5	1.10	6.6
14.....	3.25	46	1.26	7.8	1.16	6.6	0.83	3.4	1.06	6.4
15.....	3.17	44	1.26	7.8	1.16	6.6	0.83	3.4	1.03	6.2
16.....	3.17	44	1.25	7.7		6.6e	0.83	3.4	1.00	6.0
17.....	3.02	41	1.25	7.7	1.16	6.6	0.80	3.2	0.99	6.0
18.....	2.97	39	2.00	19.1	1.15	6.5	0.80	3.2	0.90	5.6
19.....	2.87	37	2.10	21.0	1.15	6.5	0.79	3.1	0.80	5.2
20.....	2.37	26	2.00	19.1	1.15	6.5	0.78	3.0	0.80	5.0
21.....	2.22	23	1.70	14.0	1.14	6.4	0.78	3.0	0.70	5.2
22.....	2.37	26	1.70	14.0	1.13	6.3	0.77	3.0	0.60	4.8
23.....	2.49	28	1.40	9.6	1.13	6.3	0.77	3.0	0.50	4.6
24.....	2.27	24	1.40	9.6	1.12	6.2	0.76	2.9	0.48	4.6
25.....	2.22	23	1.30	8.3	1.11	6.1	0.80	3.2	0.48	4.6
26.....	2.21	23	1.30	8.3	1.10	6.0	1.22	7.3	0.48	4.6
27.....	2.22	23	1.30	8.3	1.10	6.0	1.25	7.7	0.47	4.5
28.....	2.17	22	1.45	10.3	1.09	5.9	1.25	7.7	0.47	4.5
29.....	2.18	22	1.35	8.9	1.09	5.9	1.24	7.6	0.46	4.5
30.....	2.19	22	1.30	8.3	1.08	5.8	1.20	7.1	0.45	4.5
31.....			1.25	7.7	1.08	5.8			0.45	4.5

e Discharge estimated.

MONTHLY DISCHARGE of Frenchman river near Belanger, for 1916

(Drainage area 174 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
June (12-30).....	60.0	22.0	33.0	0.190	0.13	1,243
July.....	22.0	7.7	12.8	0.074	0.09	787
August.....	7.7	5.8	6.6	0.038	0.04	406
September.....	7.7	2.9	4.2	0.024	0.03	250
October.....	8.5	4.5	6.2	0.036	0.04	381
The period.....					0.33	3,067

SESSIONAL PAPER No. 25b

BELANGER CREEK AT OAKES' RANCH

Location.—On the NE. $\frac{1}{4}$ Sec. 19, Tp. 6, Rge. 25, W. 3rd Mer. Previous to August 7, 1915, was a mile up stream on the SW. $\frac{1}{4}$ Sec. 30, Tp. 6, Rge. 25, W. 3rd Mer.

Records available.—April 1, 1912, to April 11, 1914, and June 17, 1915, to October 31, 1916.

Gauge.—Vertical staff. The zero elevation of the gauge was maintained at 3,164.10 feet from date of establishment until August 7, 1915; from August 7, 1915, until October 31, 1916, it was maintained at 3,447.71 feet. (This elevation was incorrectly reported in 1915 report.)

Bench-mark.—Permanent iron bench-mark; elevation 3,168.37 feet above mean sea-level. (Irrigation Survey).

Channel.—Slightly shifting, affected by weeds.

Discharge measurements.—Made with current-meter.

Winter flow.—This station is not maintained during the winter.

Diversions.—R. H. Williamson, T. A. Drury, J. H. G. Bettington and Messrs. Dixon and Stewart divert water for irrigation purposes above the gauge.

Observer.—Joseph Drury.

Note.—Gauge heights from February 20 to March 31, 1916, are unreliable and not published.

DISCHARGE MEASUREMENTS of Belanger creek at Oakes' ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 6.....	M. H. French.....	10.0	14.0	0.66	4.69	9.2
May 11.....	J. E. Caughey.....	10.0	16.4	0.67	3.37	11.0
June 12.....	do.....	62.0	115.6	1.49	7.50	172.0
July 12.....	do.....	11.0	21.6	0.58	3.87	12.6
Sept. 2.....	L. B. P. Miles.....	6.5	16.1	0.54	1.69	8.7
Oct. 21.....	do.....	9.0	19.4	0.67	3.48	13.0

DAILY GAUGE HEIGHT AND DISCHARGE of Belanger creek at Oakes' ranch, for 1916

DAY	April		May		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	5.14	10.0c	.....x	.....	5.30	26.0	4.00	13.3
2.....	4.73	9.0e	.....	.....	5.00	22.0	4.00	13.3
3.....	3.23	8.0e	.....	.....	4.10	13.9	4.30	15.3
4.....	4.68	9.2e	.....	.....	4.10	13.9	4.60	17.9
5.....	.....	9.2e	.....	.....	4.90	21.0	4.50	16.9
6.....	4.68	9.2d	.....	.....	4.80	20.0	4.47	16.6
7.....	4.13	14.1	.....	.....	4.58	17.1	4.40	16.0
8.....	4.70	19.0	.....	.....	4.30	15.3	4.30	15.3
9.....	4.68	18.8	.....	.....	.....	15.0e	4.31	15.4
10.....	4.58	17.7	.....x	.....	4.20	14.6	4.31	15.4
11.....	4.23	14.8	3.37	10.6	5.90	32.0	4.31	15.4
12.....	4.13	14.1	.....	10.5e	7.50	50.0	3.87	12.6
13.....	4.08	13.8	.....	10.5e	6.49	39.0	3.85	12.6
14.....	4.03	13.5	3.27	10.4	5.00	22.0	3.80	12.3
15.....	4.18	14.5	3.30	10.5	4.95	22.0	3.80	12.3
16.....	4.13	14.1	3.30	10.5	4.90	21.0	3.80	12.3
17.....	4.08	13.8	3.30	10.5	4.85	21.0	4.20	14.6
18.....	4.06	13.7	3.50	11.0	4.70	19.0	4.45	16.4
19.....	4.07	13.7	3.56	11.2	4.68	18.8	4.35	15.6
20.....	4.05	13.6	4.00	13.3	4.68	18.8	4.35	15.6
21.....	4.02	13.4	4.31	15.4	5.00	22.0	4.35	15.6
22.....	3.98	13.2	4.31	15.4	5.10	23.0	4.35	15.6
23.....	4.58	17.7	4.51	17.0	5.20	24.0	4.32	15.4
24.....	4.68	18.8	4.60	17.9	5.00	22.0	4.30	15.3
25.....	4.98	22.0	4.90	21.0	4.90	21.0	4.25	15.0
26.....	5.08	23.0	5.00	22.0	4.90	21.0	4.25	15.0
27.....	5.78	31.0	5.70	30.0	4.89	21.0	5.90	32.0
28.....	6.13	35.0	6.05	34.0	4.91	21.0	5.95	33.0
29.....	6.12	35.0	6.07	34.0	4.00	13.3	5.85	32.0
30.....	.....	.....	5.85	32.0	4.30	15.3	4.98	22.0
31.....	.....	.....	5.00	22.0	.....	.....	4.90	21.0

Observer's records, prior to April 1, unreliable; not published.

d Actual measurement.

e Discharge estimated.

x-x No gauge heights available.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Belanger creek at Oakes' ranch, for 1916—*Concluded*

DAY	August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	4.80	20.0	3.94	13.0	3.75	12.0
2.....	4.75	19.6	1.69	8.5	3.95	13.0
3.....	4.69	18.9	1.70	8.5	4.00	13.3
4.....	4.60	17.9	1.70	8.5	3.90	12.8
5.....	4.54	17.3	1.80	8.5	3.81	12.2
6.....	4.49	16.8	1.80	8.5	3.91	12.8
7.....	4.45	16.4	1.80	8.5	3.96	13.1
8.....	4.45	16.4	1.85	8.6	4.11	14.0
9.....	4.49	16.8	1.87	8.6	4.11	14.0
10.....	4.50	16.9	1.85	8.6	4.08	13.8
11.....	4.48	16.7	1.85	8.6	4.04	13.5
12.....	4.47	16.6	1.85	8.6	4.01	13.4
13.....	4.46	16.5	1.84	8.5	3.96	13.1
14.....	4.46	16.5	1.82	8.5	3.93	13.0
15.....	4.44	16.4	1.80	8.5	3.88	12.7
16.....	4.44	16.4	1.80	8.5	3.88	12.7
17.....	4.40	16.0	3.60	11.4	3.87	12.6
18.....	4.35	15.6	3.65	11.6	3.87	12.6
19.....	4.35	15.6	3.65	11.6	3.87	12.6
20.....	4.30	15.3	3.69	11.8	3.87	12.6
21.....	4.20	14.6	3.70	11.8	3.48	10.9
22.....	4.15	14.2	3.70	11.8	3.48	10.9
23.....	4.13	14.1	3.72	12.2	3.48	10.9
24.....	4.07	13.7	3.73	12.0	3.48	10.9
25.....	4.00	13.3	3.75	12.0	3.48	10.9
26.....	3.95	13.0	4.20	14.6	3.45	10.8
27.....	3.95	13.0	4.00	13.3	3.43	10.8
28.....	3.94	13.0	3.90	12.8	3.40	10.7
29.....	3.91	13.0	3.80	12.3	3.35	10.6
30.....	3.94	13.0	3.75	12.0	3.33	10.6
31.....	3.95	13.0	.....	.....	3.32	10.5

MONTHLY DISCHARGE of Belanger creek at Oakes' ranch, for 1916

(Drainage area 65 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April.....	35.0	8.0	16.3	0.251	0.28	938
May (11-31).....	34.0	10.4	17.6	0.271	0.31	733
June.....	50.0	13.3	22.0	0.388	0.38	1,309
July.....	33.0	12.3	17.0	0.262	0.30	1,045
August.....	20.0	13.0	15.7	0.242	0.28	965
September.....	14.6	8.5	10.4	0.160	0.18	619
October.....	14.0	10.5	12.2	0.188	0.22	750
The period.....	.....	.....	.....	.....	1.95	6,359

MEAN MONTHLY DISCHARGE in Second-feet of Belanger creek at Oakes' ranch

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		4.60	1.16	2.80	10.8 ^k	3.4		6.9	12.2	5.2	318
November				1.10 ^e	8.8 ^l						
December											
January											
February											
March			26.00 ^b								
April		6.30	17.20 ^c	113.0	73.0	^m		16.3		52.0	3,104
May		5.70		22.0 ^f	9.9			17.6 ^p		7.8	480
June	47.0 ^a	5.50		8.2 ^g	7.2		16.8 ⁿ	22.0		11.6	688
July	22.0	2.20		8.5	6.0		21.0	17.0		12.8	787
August	6.3	1.91	2.90 ^d		4.3		6.9	15.7		7.0	431
September	4.2	1.35	2.50	10.3 ^h	3.1		7.1	10.4		4.8	284
Total in acre-ft....	3,666	1,666	1,752	8,569	6,670	208	2,589	6,033			6,092

^a 12-20; 22-30.^b 15-31.^c 1-6.^d 13-31.^e 1-19.^f 1-16.^g 13 and 18-30^h Partial month.^k do do^l 1-15.^m No observer after April 11; insufficient records to compute discharge.ⁿ 17-30.^p 11-31.

Prior to 1912 records taken at Garrison's ranch, Sec. 18, Tp. 7, Rge. 25, W. 3rd Mer. Drainage area 43 square miles.

DAVIS CREEK AT DRURY'S RANCH

Location.—On the NE. $\frac{1}{4}$ Sec. 29, Tp. 6, Rge. 25, W. 3rd Mer.*Records available.*—May 24 to November 3, 1909, and April 23, 1911, to October 31, 1916.*Gauge.*—Vertical staff; zero elevation has been maintained at 3,176.79 feet since establishment.*Bench-mark.*—Permanent iron bench-mark; elevation 3,183.06 feet above mean sea-level. (Irrigation Surveys.)*Channel.*—Permanent.*Discharge measurements.*—Made by wading with current-meter, or by weir at low stages.*Winter flow.*—This station is not maintained during the winter.*Observer.*—Joseph Drury.

DISCHARGE MEASUREMENTS of Davis creek at Drury's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 28	M. H. French	25.0	21.20	3.24	1.10	68.0
April 5	do	16.0	11.40	2.46	0.67	28.0
May 11	J. E. Caughey	10.7	4.55	1.80	0.39	8.2
June 9	do	10.0	5.80	2.50	0.48	14.5
June 11	do	35.0	54.80	3.41	2.53	187.0
July 11	do	7.2	3.13	1.33	0.25	4.2
July 27	do	30.0	45.90	2.85	1.73	131.0
Sept. 2	L. B. P. Miles	11.0	2.94	0.80	0.23	2.4
Oct. 21	do	13.4	5.92	1.77	0.42	10.5

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Davis creek at Drury's ranch, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			2.15	173.0	0.76	36.0	0.50	15.4	0.88	46.0
2.....			2.10	168.0	0.66	27.0	0.50	15.4	0.81	40.0
3.....			1.01	59.0	0.61	23.0	0.47	13.6	0.72	32.0
4.....			0.95	53.0	0.58	21.0	0.47	13.6	0.63	25.0
5.....			0.85	43.0	0.58	21.0	0.46	13.0	.....	122.0
6.....			0.80	39.0	0.58	21.0	0.46	13.0	1.50	108.0
7.....			0.75	35.0	0.56	19.6	0.44	11.8	0.87	45.0
8.....			0.69	30.0	0.56	19.6	0.43	11.3	0.69	30.0
9.....			0.49	14.8	0.76	36.0	0.42	10.7	0.48	14.2
10.....			0.47	13.6	0.90	48.0	0.42	10.7	0.60	23.0
11.....			0.49	14.8	0.74	34.0	0.39	9.1	2.30	164.0s
12.....			0.50	15.4	0.67	28.0	0.39	9.1	1.59	95.0
13.....			.....	184.0e	0.70	31.0	0.41	10.2	1.58	96.0
14.....			3.95	353.0	0.66	27.0	0.40	9.6	0.86	29.0
15.....			2.70	228.0	0.73	33.0	0.40	9.6	0.55	9.1
16.....			1.45	103.0	0.73	33.0	0.40	9.6	0.54	9.6
17.....			0.63	25.0	0.77	36.0	0.40	9.6	0.48	7.7
18.....	2.50	209	0.69	30.0	0.94	52.0	0.39	9.1	0.46	7.7
19.....	2.51	209	0.63	25.0	0.70	31.0	0.37	8.2	0.44	7.7
20.....	2.54	212	1.00	58.0	0.64	26.0	0.35	7.4	0.42	7.7
21.....	2.49	207	2.97	255.0	0.58	21.0	0.35	7.2	0.35	5.4
22.....	2.48	206	4.35	393.0	0.55	18.8	0.35	7.2	0.68	27.0s
23.....	2.45	203	2.13	171.0	0.56	19.6	0.39	9.1	1.50	108.0
24.....	2.43	201	1.37	95.0	0.55	18.8	0.45	12.4	1.28	86.0
25.....	2.39	197	1.55	113.0	0.54	18.1	1.06	64.0	1.15	73.0
26.....	2.35	193	1.30	88.0	0.52	16.8	1.06	64.0	0.98	56.0
27.....	2.29	187	1.57	115.0	0.52	16.8	1.95	153.0	0.94	52.0
28.....	2.25	183	1.33	91.0	0.52	16.8	2.10	168.0	0.88	46.0
29.....	2.20	178	0.87	45.0	0.52	16.8	1.90	148.0	0.73	33.0
30.....			0.89	47.0	0.50	15.4	1.76	134.0	0.75	35.0
31.....			0.77	36.0	.....	.....	0.94	52.0	.....	.....

s-s Shifting conditions.
e Discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Davis creek at Drury's ranch, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	0.70	31.00	1.79	137.0	0.22	2.6	0.39	9.1
2.....	0.65	26.00	1.01	59.0	0.22	2.6	0.44	11.8
3.....	0.58	21.00	0.94	52.0	0.23	2.8	0.44	11.8
4.....	0.94	52.00	0.74	34.0	0.23	2.8	0.42	10.7
5.....	0.85	43.00	0.52	16.8	0.23	2.8	0.39	9.1
6.....	0.74	34.00	0.40	9.6	0.29	4.7	0.44	11.8
7.....	0.60	23.00	0.38	8.6	0.33	6.3	0.54	18.1
8.....	0.48	14.20	0.36	7.7	0.29	4.7	0.69	30.0
9.....	0.35	7.20	0.38	8.6	0.30	5.0	0.64	26.0
10.....	0.30	5.00	0.38	8.6	0.29	4.7	0.62	24.0
11.....	0.28	4.40	0.38	8.6	0.29	4.7	0.60	23.0
12.....	0.22	2.60	0.36	7.7	0.28	4.4	0.54	18.1
13.....	0.20	2.00	0.34	6.8	0.28	4.4	0.52	16.8
14.....	0.20	2.00	0.33	6.3	0.26	3.7	0.49	14.8
15.....	0.20	2.00	0.31	5.4	0.24	3.1	0.46	13.0
16.....	0.19	1.76	0.29	4.7	0.24	3.1	0.44	11.8
17.....	0.20	2.00	0.27	4.0	0.24	3.1	0.44	11.8
18.....	0.25	3.40	0.25	3.4	0.24	3.1	0.44	11.8
19.....	0.27	4.00	0.25	3.4	0.24	3.1	0.44	11.8
20.....			0.25	3.4	0.24	3.1	0.44	11.8
21.....			0.24	3.1	0.24	3.1	0.42	10.7
22.....			0.24	3.1	0.23	2.8	0.42	10.7
23.....			0.24	3.1	0.23	2.8	0.42	10.7
24.....			0.23	2.8	0.23	2.8	0.42	10.7
25.....			0.23	2.8	0.24	3.1	0.41	10.2
26.....			0.23	2.8	0.42	10.7	0.41	10.2
27.....			0.23	2.8	0.44	11.8	0.41	10.2
28.....			0.22	2.6	0.44	11.8	0.39	9.1
29.....			0.22	2.6	0.42	10.7	0.39	9.1
30.....			0.22	2.6	0.41	10.2	0.39	9.1
31.....			0.22	2.6			0.38	8.6

Observer's records, July 20-31, unreliable; not published.

MONTHLY DISCHARGE of Davis creek at Drury's ranch, for 1916

(Drainage area 45 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (18-29).....	212.0	178.00	199.0	4.420	0.197	4,735
March.....	393.0	13.60	100.0	2.220	2.560	6,149
April.....	52.0	15.40	26.0	0.578	0.645	1,547
May.....	168.0	7.20	34.0	0.756	0.872	2,090
June.....	164.0	5.40	48.0	1.070	1.190	2,856
July (1-19).....	52.0	1.76	14.8	0.328	0.232	558
August.....	137.0	2.60	13.7	0.304	0.350	842
September.....	11.8	2.60	4.8	0.107	0.119	286
October.....	30.0	8.60	13.2	0.294	0.339	812
The period.....					6.504	19,875

SESSIONAL PAPER No. 25B

MEAN MONTHLY DISCHARGE in Second-feet of Davis creek at Drury's ranch

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		0.60		5.40 _g	1.90	0.07	....._m	2.70	13.2	3.7	227
November		1.65 _c			2.80 _k						
December											
January											
February								199.0 _o			
March						22.00 _k	9.00 _n	100.0		100.0	6,149
April			58.00 _d	143.00	77.00	44.00	58.00	26.0		51.0	3,049
May	20.00 _a		12.90	27.00	8.00	7.20	6.80	34.0		16.0	979
June	14.80 _b		4.50	7.00	2.80	1.97	16.80	48.0		13.5	788
July	19.40		19.20 _e	1.66	2.90	1.85	14.50	14.8 _p		8.1	495
August	2.00		0.70 _f	1.41	1.55	0.20 _l	2.50	13.7		4.2	260
September	1.23		5.10	0.74	0.22	....._m	1.23	4.8		2.2	132
Total in acre-ft....	2,503	47	2,497	10,945	5,755	4,156	6,149	19,229			12,079

a 24-31.

b 1-19 and 23-30.

c 1-3.

d 23-30.

e 1-4 and 13.

f 15-31.

g 1-16.

h 1-15.

k 10-31.

l 22-31.

m No observer.

n 23-31.

o 18-29.

p 1-19.

FAIRWELL CREEK AT DRURY'S RANCH

Location.—On the NW. $\frac{1}{4}$ Sec. 30, Tp. 6, Rge. 24, W. 3rd Mer.*Records available.*—June 10, 1909, to October 31, 1916.*Gauge.*—Vertical staff; zero elevation has been maintained at 3,122.77 feet since establishment.*Bench-mark.*—Permanent iron bench-mark; elevation 3,127.64 feet above sea-level (Irrigation Surveys datum).*Channel.*—Slightly shifting, owing to beaver dams.*Discharge measurements.*—Made with current-meter, and weir at low stages.*Diversions.*—Messrs. Armstrong & Sons, Kearney Bros. and J. Ingram divert water for irrigation purposes above this gauge.*Observer.*—C. A. Drury.

DISCHARGE MEASUREMENTS of Fairwell creek at Drury's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 27	M. H. French	100.0	127.00	2.54	3.73	323.0
April 5	do	14.0	12.40	2.67	2.68	33.0
May 11	J. E. Caughey	15.0	9.35	2.35	2.39	22.0
June 9	do	14.0	11.60	2.58	2.52	30.0
June 13	do	22.0	27.90	3.20	2.85	89.0
July 11	do	13.5	7.23	2.06	2.30	14.9
July 26	do	13.8	7.39	1.76	2.33	13.0
Sept. 1	L. P. B. Miles	13.5	4.55	1.55	2.15	7.1
Oct. 13	do	13.8	13.10	1.91	2.48	25.0 _x

x Beavers diverting water above the gauge.

DAILY GAUGE HEIGHT AND DISCHARGE of Fairwell creek at Drury's ranch, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			2.59		3.25	195	2.55	33.0	2.73	61.0
2.....			2.54		3.15	168	2.53	31.0	2.65	47.0
3.....			2.44		3.05	142	2.55	33.0	2.63	44.0
4.....			2.44		2.95	115	2.55	33.0	2.59	38.0
5.....			2.39		2.90	102	2.55	33.0	2.59	38.0
6.....			2.39		2.85	89	2.53	31.0	3.00	128.0
7.....			2.34		2.85	89	2.52	30.0	2.75	65.0
8.....			2.34		2.85	89	2.50	28.0	2.60	39.0
9.....			2.34		2.95	115	2.45	24.0	2.50	28.0
10.....			2.29		3.05	142	2.40	19.8	2.55	33.0
11.....			3.39		3.20	182	2.40	19.8	2.95	115.0
12.....			4.39		3.10	155	2.40	19.8	3.00	128.0
13.....			4.14		3.00	128	2.35	16.8	2.80	76.0
14.....			3.49		3.00	128	2.35	16.8	2.65	47.0
15.....			3.57		3.00	128	2.35	16.8	2.56	34.0
16.....			3.47		2.95	115	2.40	19.8	2.48	26.0
17.....			3.32		2.80	76	2.38	18.6	2.44	23.0
18.....			3.07		2.90	102	2.42	21.0	2.40	19.8
19.....			3.11		2.90	102	2.40	19.8	2.38	18.6
20.....	2.68		3.21		2.85	89	2.35	16.8	2.35	16.8
21.....	3.22		4.47		2.80	76	2.35	16.8	2.33	15.6
22.....	3.30		4.49		2.75	65	2.34	16.2	2.45	24.0
23.....	3.30		3.74		2.70	55	2.34	16.2	2.95	115.0
24.....	3.19		3.39		2.69	53	2.38	18.6	2.80	76.0
25.....	3.07		3.21		2.67	50	2.80	76.0	2.65	47.0
26.....	2.97		3.14		2.65	47	2.99	126.0	2.53	31.0
27.....	2.89		3.73	323 <i>d</i>	2.61	41	3.20	182.0	2.40	19.8
28.....	2.77		3.70	314	2.57	36	3.20	182.0	2.39	19.2
29.....	2.69		3.50	261	2.55	33	3.15	168.0	2.44	23.0
30.....			3.40	235	2.55	33	3.10	155.0	2.65	47.0
31.....			3.30	208			2.85	89.0		

Discharge affected by ice, February 20 to March 26; gauge heights only published.
d Actual measurement.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Fairwell creek at Drury's ranch, for 1916.—*Concluded.*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	2.65	47.0	2.40	19.8	2.15	7.2	2.05	4.0
2.....	2.60	39.0	2.36	17.4	2.15	7.2	2.10	5.4
3.....	2.70	55.0	2.33	15.6	2.15	7.2	2.10	5.4
4.....	2.65	47.0	2.29	13.3	2.18	8.3	2.15	7.2
5.....	2.47	25.0	2.27	12.4	2.15	7.2	2.16	7.6
6.....	2.40	19.8	2.25	11.4	2.15	7.2	2.21	9.5
7.....	2.36	17.4	2.23	10.4	2.15	7.2	2.36	17.4
8.....	2.35	16.8	2.22	10.0	2.14	6.8	2.41	21.0
9.....	2.34	16.2	2.35	16.8	2.14	6.8	2.41	21.0
10.....	2.36	17.4	2.55	33.0	2.14	6.8	2.44	23.0
11.....	2.34	16.2	2.45	24.0	2.13	6.5	2.46	24.0
12.....	2.30	13.8	2.35	16.8	2.13	6.5	2.46	24.0
13.....	2.27	12.4	2.30	13.8	2.12	6.1	2.48	26.0
14.....	2.26	11.9	2.25	11.4	2.12	6.1	2.48	26.0
15.....	2.25	11.4	2.23	10.4	2.10	5.4	2.44	23.0
16.....	2.26	11.9	2.23	10.4	2.10	5.4	2.44	23.0
17.....	2.24	10.9	2.22	10.0	2.10	5.4	2.43	22.0
18.....	2.25	11.4	2.22	10.0	2.10	5.4	2.41	21.0
19.....	2.25	11.4	2.22	10.0	2.09	5.1	2.37	18.0
20.....	2.24	10.9	2.22	10.0	2.09	5.1	2.35	16.8
21.....	2.22	10.0	2.21	9.5	2.08	4.8 _x	2.35	16.8
22.....	2.20	9.0	2.21	9.5	2.07	4.6	2.35	16.8
23.....	2.19	8.6	2.21	9.5	2.05	4.0	2.35	16.8
24.....	2.18	8.3	2.21	9.5	2.05	4.0	2.35	16.8
25.....	2.18	8.3	2.21	9.5	2.06	4.3	2.33	15.6
26.....	2.33	15.6	2.20	9.0	2.09	5.1	2.33	15.6
27.....	3.00	128.0	2.19	8.6	2.10	5.4	2.31	14.4
28.....	2.80	76.0	2.18	8.3	2.08	4.8	2.26	11.9
29.....	2.68	51.0	2.18	8.3	2.06	4.3	2.26	11.9
30.....	2.50	28.0	2.17	7.9	2.05	4.0	2.23	10.4
31.....	2.45	24.0	2.16	7.6	.....	.....	2.23	10.4

_x Beavers diverting water above the gauge.
Small flow continued for period in November.

MONTHLY DISCHARGE of Fairwell creek at Drury's ranch, for 1916

(Drainage area 125 square miles)

MONTH	DISCHARGE IN SECOND-FeET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (27-31).....	323.0	208.0	268.0	2.140	0.40	2,657
April.....	195.0	33.0	98.0	0.784	0.87	5,831
May.....	182.0	16.2	49.0	0.392	0.45	3,013
June.....	128.0	15.6	48.0	0.384	0.43	2,856
July.....	128.0	8.3	25.0	0.200	0.23	1,537
August.....	33.0	7.6	12.4	0.099	0.11	762
September.....	8.3	4.0	5.8	0.046	0.05	345
October.....	26.0	4.0	16.2	0.130	0.15	996
The period.....	.....	.....	.....	.....	2.69	17,997

MEAN MONTHLY DISCHARGE in Second-feet of Fairwell creek at Drury's ranch

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		3.40	0.96	8.4 _e	3.9 12.2 _g	1.08	1.08	3.40	16.2	4.3	264
Nov.....											
Dec.....											
January.....											
February.....											
March.....			166.00 _c			34.00 _h	1.53 _k	268.0 _f			
April.....		18.30 _b	129.00	313.0 _f	122.0	102.00	65.00	98.0		103.0	6,135
May.....		13.00	24.00 _d	17.2	14.4	14.20	14.70	49.0		20.0	1,255
June.....	87.0 _a	5.00	10.90	8.0	7.2	6.60	64.00	48.0		21.0	1,273
July.....	44.0	2.70	8.40	5.3	5.7	2.60	15.90	25.0		13.7	842
August.....	7.3	2.60	3.70	4.9	3.8	1.21	8.90	12.4		5.6	345
Sept.....	4.6	1.59	2.90	4.1	2.9	1.22	4.50	5.8		3.5	206
Total in Acre-ft.	1,033	2,168	13,833	16,529	9,918	9,334	10,463	17,210			10,320

a 10-30

b 19-30.

c 9-30.

d 1-15.

e 8-31.

f 20-31.

g 1-10 and 17-18.

h 1-28.

k 24-31.

l 27-31.

A. M. CROSS DITCH FROM CALF CREEK

Location.—On SE. $\frac{1}{4}$ Sec. 5, Tp. 8, Rge. 22, W. 3rd Mer.*Records available.*—June 1, 1914, to close of irrigation season 1916.*Gauge.*—Vertical staff located about forty feet from the intake of the ditch. Elevation of the zero of the gauge referred to P.I.B.M. has been maintained at 96.36 feet since establishment.*Bench-mark.*—Permanent iron, set July 29, 1915; assumed elevation 100.00 feet.*Channel.*—Slightly shifting, owing to growth of weeds.*Discharge measurements.*—Made with current-meter.*Observer.*—A. M. Cross.*Remarks.*—No water used during irrigation season of 1916.

F. CROSS DITCH FROM NORTH BRANCH OF FRENCHMAN RIVER

Location.—On NW. $\frac{1}{4}$ Sec. 15, Tp. 7, Rge. 22, W. 3rd Mer., about 130 feet from the intake of the ditch.*Records available.*—During irrigation season, 1912 to 1916.*Gauge.*—Staff fastened to the left side of the flume; elevation of zero maintained at 94.45 feet from establishment to July 27, 1915, and at elevation 96.63 feet since that date.*Bench-mark.*—On July 27, 1915, a permanent iron bench-mark was set on the right bank about 10 feet north of the gauge; the assumed elevation is 100.00 feet.*Discharge measurements.*—Made by current-meter at the section, or by a weir in the ditch.*Observer.*—Frank Cross.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of F. Cross ditch from North branch of Frenchman river, for 1916

MAY			JUNE			JUNE			JULY		
Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>
21	1.46 ^h	.....	4	1.42	.....	18	1.42	.....	1	1.33	.....
22	1.46	.....	5	1.50	.....	19	1.42	.....	2	1.25	.....
23	1.50	.....	6	1.46	.....	20	1.42	.....		
24	1.50 ^h	.....	7	1.42	.....	21	1.33	.....		
			8	1.35	4.1 ^d	22	1.50	.....		
			9	1.42	.....	23	1.54	.....		
			10	1.50	.....	24	1.42	.....		
			11	1.50 ^h	.....	25	1.38	.....		
			12		.....	26	1.29	.....		
			13		.....	27	1.29	.....		
			14	1.42 ^h	.....	28	1.25	.....		
			15	1.42	.....	29	1.33	.....		
			16	1.42	.....	30	1.42	.....		
			17	1.42	.....					

^h Headgate opened May 21, closed May 24; opened June 4, closed June 11; opened June 14, closed July 2.^d Actual measurement; no others taken during season; therefore unable to plot curve and compute daily discharge.

NORTH BRANCH OF FRENCHMAN RIVER AT F. CROSS' RANCH

Location.—On the NE. $\frac{1}{4}$ Sec. 16, Tp. 7, Rge. 22, W. 3rd Mer., at F. Cross' ranch near East End.*Records available.*—August 1, 1908, to October 31, 1916.*Gauge.*—Vertical staff. The elevation of zero maintained at 91.28 feet during 1908-11. The elevation of zero maintained at 90.27 feet during 1912-16.*Bench-mark.*—Permanent iron bench-mark; assumed elevation 100.00 feet.*Channel.*—Sandy and slightly shifting.*Discharge measurements.*—Made by wading.*Winter flow.*—Station not maintained during winter.*Diversions.*—F. Cross and A. M. Cross divert water above this station for irrigation. F. Cross was the only one to divert water during 1915 and 1916.*Observer.*—Frank Cross.

DISCHARGE MEASUREMENTS of North branch of Frenchman river at F. Cross' ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
March 22	M. H. French	.....	.....	.....	.....	138.0 ^w
April 3	do	11.2	6.12	3.01	3.38	18.4 ^g
April 10	do	20.0	20.60	1.60	1.34	33.0 ^g
May 8	J. E. Caughey	11.6	8.04	1.54	0.70	12.4
June 8	do	12.0	7.12	1.24	0.62	8.8
July 10	do	12.0	7.10	1.04	0.64	7.4
July 24	do	12.0	7.25	0.78	0.63	5.7
Aug. 30	L. P. B. Miles	11.7	6.93	0.81	0.65	5.6
Oct. 27	do	11.6	7.24	1.35	0.76	9.8

^x Gauge inaccessible.^w Weir measurements over Cross' dam.^g Ice going out.

DAILY GAUGE HEIGHT AND DISCHARGE of North branch of Frenchman river at F. Cross' ranch,
for 1916

DAY	April		May		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	3.90	33.0s	0.75	15.2	0.83	13.4	0.58	5.7
2.....	3.65	25.0	0.73	14.6	0.82	13.2	0.50	4.8
3.....	3.38	18.4d	0.72	14.2	0.75	11.5	0.68	6.9
4.....	3.02	18.8	0.74	14.3	0.65	9.8	0.84	9.4
5.....	2.10	8.4	0.70	13.3	0.65	9.8	0.74	7.8
6.....	2.43	23.0	0.68	12.6	0.95	15.4	0.68	6.9
7.....	2.54	37.0	0.68	12.3	0.75	11.5	0.64	6.4
8.....	1.84	27.0	0.70	12.4d	0.62	8.8d	0.65	6.6
9.....	1.43	25.0	0.70	12.4	0.64	9.1	0.61	6.0
10.....	1.34	33.0d	0.71	12.6	0.70	10.0	0.63	6.3
11.....	1.32	32.0	0.69	12.1	0.83	12.4	0.61	6.0
12.....	1.18	28.0	0.67	11.8	0.95	14.7	0.60	5.9
13.....	1.17	28.0	0.69	11.9	0.76	11.2s	0.59	5.8
14.....	1.15	27.0	0.68	11.8	0.70	7.2	0.59	5.8
15.....	1.13	26.0	0.76	13.3	0.65	6.6	0.59	5.8
16.....	1.08	25.0	0.74	12.8	0.67	6.8	0.59	5.8
17.....	0.78	17.4	0.79	13.8	0.67	6.8	0.58	5.7
18.....	0.94	21.0	0.73	12.4	0.67	6.8	0.73	7.6
19.....	0.81	18.0	0.69	11.6	0.65	6.6	0.68	6.9
20.....	0.79	17.4	0.68	11.4	0.65	6.6	0.64	6.4
21.....	0.77	17.0	0.58	9.8	0.54	5.2	0.61	6.0
22.....	0.75	16.4	0.58	9.8	0.73	7.6	0.60	5.9
23.....	0.74	16.1	0.60	9.7	0.85	9.6	0.59	5.8
24.....	0.71	15.4	0.63	10.2	0.65	6.6	0.63	6.3
25.....	0.70	15.1	0.95	16.4	0.58	5.7	0.61	6.0
26.....	0.69	14.8	0.97	16.8	0.54	5.2	0.74	7.8
27.....	0.69	14.6	1.33	26.0	0.54	5.2	1.00	12.2
28.....	0.68	14.2	1.15	20.0	0.53	5.1	0.77	8.2
29.....	0.67	13.9	1.10	19.3	0.58	5.7	0.68	6.9
30.....	0.76	15.6	0.90	14.8	0.75	8.0	0.76	8.1
31.....			0.85	13.8			0.68	6.9

d Actual measurement.*s-s* Shifting conditions.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of North branch of Frenchman river at F. Cross' ranch,
for 1916—*Concluded*

DAY	August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i> ⁴
1.....	0.65	6.6	0.65	6.6	0.77	8.2
2.....	0.64	6.4	0.65	6.6	0.79	8.6
3.....	0.62	6.2	0.64	6.4	0.79	8.6
4.....	0.60	5.9	0.67	6.8	1.07	13.7
5.....	0.64	6.4	0.76	8.1	1.02	12.6
6.....	0.74	7.8	0.70	7.2	0.97	11.7
7.....	0.69	7.1	0.77	8.2	0.87	9.9
8.....	0.62	6.2	0.70	7.2	0.87	9.9
9.....	0.75	8.0	0.73	7.6	0.88	10.1
10.....	0.73	7.6	0.72	7.5	0.86	9.7
11.....	0.70	7.2	0.71	7.4	0.84	9.4
12.....	0.68	6.9	0.67	6.8	0.82	9.0
13.....	0.66	6.7	0.66	6.7	0.79	8.6
14.....	0.65	6.6	0.69	7.1	0.76	8.1
15.....	0.64	6.4	0.71	7.4	0.74	7.8
16.....	0.64	6.4	0.69	7.1	0.77	8.2
17.....	0.63	6.3	0.70	7.2	0.82	9.0
18.....	0.64	6.4	0.67	6.8	0.87	9.9
19.....	0.63	6.3	0.68	6.9	0.97	11.7
20.....	0.62	6.2	0.67	6.8	0.81	8.9
21.....	0.62	6.2	0.68	6.9	0.77	8.2
22.....	0.61	6.0	0.70	7.2	0.82	9.0
23.....	0.61	6.0	0.71	7.4	0.87	9.9
24.....	0.60	5.9	0.70	7.2	0.83	9.2
25.....	0.60	5.9	0.70	7.2	0.81	8.9
26.....	0.65	6.6	0.71	7.4	0.79	8.6
27.....	0.64	6.4	0.86	9.7	0.74	7.8
28.....	0.64	6.4	0.88	10.1	0.86	9.7
29.....	0.63	6.3	0.77	8.2	0.86	9.7
30.....	0.64	6.4	0.75	8.0	0.86	9.7
31.....	0.65	6.6	.....	.....	0.88	10.1

MONTHLY DISCHARGE of North branch of Frenchman river at F. Cross' ranch, for 1916

(Drainage area 53 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April.....	37.0	8.4	21.0	0.396	0.44	1,250
May.....	26.0	9.7	13.7	0.258	0.30	842
June.....	15.4	5.1	8.7	0.164	0.18	518
July.....	12.2	4.8	6.7	0.126	0.15	412
August.....	8.0	5.9	6.5	0.123	0.14	398
September.....	10.1	6.4	7.4	0.140	0.16	440
October.....	13.7	7.8	9.5	0.179	0.21	584
The period.....	.....	.....	.....	.....	1.58	4,444

MEAN MONTHLY DISCHARGE in Second-feet of North branch of Frenchman river at F. Cross' ranch

MONTH	1907-8	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		8.8 ^b	10.1	7.5	13.4	8.3 15.9 ^e	7.9	8.6	9.8	9.5	9.4	573
November.....												
December.....												
January.....												
February.....												
March.....												
April.....			10.8	47.0 ^a	23.0 ^d	82.0	41.0	19.0 ^c	21.0		39.0	2,302
May.....		26.0	8.8	13.2	10.2	10.4	9.9	9.1	13.7		12.7	780
June.....		18.6	4.9	7.0	7.6	9.7	7.0	10.8	8.7		9.3	552
July.....		15.7	3.5	7.9	5.9	8.5	3.6	8.6	6.7		7.6	465
August.....	4.6	7.5	4.8	6.8	6.2	6.6	4.4	7.5	6.5		6.1	375
September.....	5.6	8.7	6.2	10.8	7.4	6.5	7.1	7.9	7.4		7.5	447
Total in acre-ft.	615	4,983	2,978	5,218	4,024	8,401	4,847	4,211	4,463			5,494

a 10-30.

b 1-19.

c 4-30.

d 11-30.

e 1-5.

W. H. BARNETT DITCH FROM DOYLE CREEK

Location.—On the SE. $\frac{1}{4}$ Sec. 17 Tp. 7, Rge. 22, W. 3rd Mer., near East End post office.

Gauge.—Vertical staff attached to a four-inch round post driven into the bottom of the ditch about 100 feet S. 70°60E. from the flume; zero elevation maintained at 98.13 feet since establishment.

Bench-mark.—Permanent iron bench-mark, about one and one-half feet from the right bank of the ditch and two feet below the gauge; assumed elevation 100.00 feet.

Channel.—One channel with clay bed.

Discharge measurements.—Made with a weir.

Observer.—W. H. Barnett.

Remarks.—This station was established on July 26, 1915, by M. H. French. No records were obtained in 1915 and 1916, but it is understood that no water was used in either year.

BARROBY DITCH FROM NORTH BRANCH OF FRENCHMAN RIVER

Location.—On SE. $\frac{1}{4}$ Sec. 33, Tp. 6, Rge. 23, W. 3rd Mer.

Gauge.—Vertical staff nailed to a four-inch round post driven into the left bank of the ditch about one-quarter mile S. 12° W. of the dam. Zero elevation maintained at 97.67 feet since establishment.

Bench-mark.—Permanent iron bench-mark, situated five feet above the gauge and one and one-half feet from the right bank; assumed elevation 100.00 feet.

Channel.—One; bed of sandy loam.

Discharge measurements.—Made with current-meter or weir.

Observer.—Frank Barroby.

Remarks.—No water used during 1915 and 1916. Station visited and no flow reported.

FRENCHMAN RIVER AT PHILLIPS' RANCH

Location.—On the NE. $\frac{1}{4}$ Sec. 23, Tp. 6, Rge. 23, W. 3rd Mer., at A. T. Phillips' ranch near Ravenscrag.

Records available.—July 9, 1912, to October 31, 1915.

Gauge.—Vertical staff. The elevation of the zero of the gauge has been 3,058.50 feet since the station was established.

Bench-mark.—Permanent iron bench-mark, elevation 3,068.56 feet above sea-level (Canadian Pacific Railway datum).

Channel.—Permanent.

Discharge measurements.—Made by wading or from cable.

Winter flow.—Station not maintained during winter.

Artificial control.—A permanent control was established at this station during October, 1914, by which means more accurate records should be obtained at this station. This control was damaged by ice and floods, during spring run-off in 1916. Repairs were made in October. Shifting conditions prevailed during summer months.

Observer.—A. T. Phillips.

SESSIONAL PAPER No. 25b

DISCHARGE MEASUREMENTS of Frenchman river at Phillips' ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 29.....	M. H. French.....	42.0	112.5	5.44	4.11	612
April 4.....	do.....	52.0	79.4	2.54	2.92	202
April 7.....	do.....	49.0	65.7	2.38	2.76	156
May 10.....	J. E. Caughey.....	29.0	35.6	2.32	2.29	84
June 9.....	do.....	34.0	52.8	3.05	2.66	161
July 8.....	do.....	29.0	29.1	2.23	2.25	65
July 28.....	do.....	40.0	75.5	4.88	3.46	368
Aug. 26.....	L. P. B. Miles.....	26.0	21.5	1.49	1.90	32
Oct. 12.....	do.....	30.4	37.1	2.21	1.91 _x	82
Nov. 2.....	do.....	28.0	27.7	1.91	1.64	53

Artificial control leaking; damaged by spring floods.

_x New artificial control completed.

DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman river at Phillips' ranch, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			5.43	319 _x	3.53	392	2.39	92	3.01	226
2.....					3.31	317	2.36	87	2.82	178
3.....					3.13	261	2.27	74	2.70	150
4.....					2.95	210	2.43	98	2.54	118
5.....					2.85	185	2.43	98	2.49	108
6.....					2.78	168	2.42	96	2.81	175
7.....					2.72	155	2.37	88	3.32	321
8.....					2.71	152	2.57	123	2.93	205
9.....					2.82	178	2.46	103	2.61	131
10.....					3.18	276	2.24	70	2.50	110
11.....			5.43	319 _e	3.51	384	2.26	73	2.65	140
12.....			6.88	640 _e	3.49	378	2.24	70	3.59	412
13.....			7.83	1,329 _w	3.29	311	2.20	65	3.48	374
14.....			6.11	1,159 _e	3.24	295	2.14	58	3.02	229
15.....			4.93	989 _e	3.21	285	2.17	62	2.69	148
16.....			4.73	819 _e	3.00	223	2.20	65	2.54	118
17.....			4.67	649 _e	2.81	175	2.22	68	2.45	102
18.....			4.35	479 _e	2.81	175	2.20	65	2.36	87
19.....			4.31	309 _e	2.89	195	2.16	61	2.29	77
20.....			3.91	162 _d	2.79	171	2.10	54	2.26	73
21.....	4.11	192 _x	6.30	600 _e	2.69	148	2.10	54	2.22	68
22.....	5.23	588	6.63	1,040 _e	2.63	135	2.08	52	2.27	74
23.....	5.49	745	5.53	1,290 _e	2.61	131	2.09	53	2.72	155
24.....	5.31	647	4.23	530 _e	2.53	116	2.12	56	3.08	246
25.....	5.35	662	3.65	160 _e	2.48	107	2.59	127	2.88	192
26.....	5.88	1,026	3.68	140 _e	2.39	92	2.92	202	2.62	133
27.....	5.57	785	4.78	893	2.39	92	3.30	314	2.48	107
28.....	5.25	610	4.78	893	2.45	102	3.58	409	2.39	92
29.....	4.93	460	4.25	670	2.57	123	3.52	388	2.34	84
30.....			3.72	459	2.45	102	3.48	374	2.48	107
31.....			3.47	371			3.33	323		

_{x-x} Discharge determined from slope data; no records Mar. 2 to Mar. 10._w Discharge determined from head on Strong's dam._e Discharge estimated._d Actual measurement at East End.

DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman river at Phillips' ranch, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	2.60	129	2.36	87	1.84	31	.....	56 ^e
2.....	2.48	107	2.21	66	1.84	31	.....	65 ^e
3.....	2.42	96	2.08	52	1.84	31	.....	75 ^e
4.....	2.59	127	2.04	48	1.91	36	.....	85 ^e
5.....	2.56	121	2.02	46	1.96	40	.....	90 ^e
6.....	2.44	100	2.05	49	1.98	42	.....	95 ^e
7.....	2.30	78	2.04	48	1.95	40	.....	90 ^e
8.....	2.24	70	2.00	44	1.95	40	.....	90 ^e
9.....	2.21	66	2.03	47	1.97	41	.....	87 ^e
10.....	2.28	75	2.18	63	1.96	40	.....	83 ^e
11.....	2.25	72	2.24	70	1.93	38	1.86	80 ^x
12.....	2.13	57	2.23	69	1.93	38	1.90	82 ^d
13.....	2.07	51	2.18	63	1.88	34	1.97	89
14.....	2.04	48	2.10	54	1.86	32	1.97	89
15.....	2.02	46	2.04	48	1.85	32	1.93	83
16.....	2.00	44	1.99	43	1.85	32	1.89	78
17.....	2.03	47	1.95	40	1.85	32	1.82	70
18.....	2.08	52	1.94	39	1.85	32	1.79	67
19.....	2.10	54	1.90	35	1.84	31	1.76	64
20.....	2.10	54	1.90	35	1.83	30	1.74	62
21.....	2.08	52	1.90	35	1.80	28	1.71	59
22.....	2.02	46	1.92	37	1.78	27	1.70	58
23.....	1.96	40	1.90	35	1.77	26	1.71	59
24.....	1.92	37	1.86	32	1.80	28	1.71	59
25.....	1.90	35	1.84	31	1.84	31	1.71	59
26.....	1.92	37	1.88	34	1.88	34	1.69	57
27.....	2.73	157	1.87	33	2.00	44	1.67	55
28.....	3.52	388	1.86	32	2.15	60	1.66	54
29.....	2.90	197	1.85	32	2.24	60 ^e	1.65	53
30.....	2.71	152	1.85	32	.....	58 ^{ez}	1.69	57
31.....	2.52	114	1.86	32	.....	.....	1.67	55

^e Discharge estimated.^x Work on new control started Sept. 30. New control completed, Oct. 11.^d Actual measurement at East End.

MONTHLY DISCHARGE of Frenchman river at Phillips' ranch, for 1916

(Drainage area 598 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (21-29).....	1,026	192	635	1.060	0.35	11,333
March (1, 11-31).....	1,329	319	646	1.080	0.88	28,182
April.....	392	92	201	0.336	0.37	11,960
May.....	409	52	127	0.212	0.24	7,809
June.....	412	68	158	0.264	0.29	9,402
July.....	388	35	89	0.149	0.17	5,472
August.....	87	31	46	0.077	0.09	2,828
September.....	60	26	37	0.062	0.07	2,202
October.....	95	53	71	0.119	0.14	4,366
The period.....	.....	.....	.....	.....	2.60	83,554

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of Frenchman river at Phillips' ranch

MONTH	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		22.0	17.2	22	24	71	31	1,921
November.....		35.0 ^b						
December.....								
January.....								
February.....					635 ^f			
March.....			81.0 ^d	69 ^e	646 ^h			
April.....		443.0 ^c	236.0	342	201		260	15,451
May.....		55.0	43.0	49	127		68	4,207
June.....		36.0	28.0	73	158		74	4,393
July.....		23.0 ^a	24.0	7.1	60		45	2,762
August.....		16.9	13.7	4.8	27		22	1,333
September.....		18.0	13.3	13.5	22	37	21	1,235
Total in acre-ft.....	3,141	32,971	24,002	37,086	80,664			31,302

a 9-31.

b 1-15.

c 6-30.

d 13-31.

e 22-31.

f 21-29.

h 11-31.

STRONG'S DITCH AT EAST END

Location.—On the NE. $\frac{1}{4}$ Sec. 25, Tp. 6, Rge. 22, W. 3rd Mer., about one-half mile below the headgate of the ditch.

Records available.—May 9, 1909, to October 31, 1916.

Gauge.—Vertical staff fastened to a post on the right bank; the elevation of the zero of the gauge maintained at 2,982.47 feet since establishment.

Bench-mark.—Permanent iron bench-mark near the gauge; elevation 2,994.31 (C.P.R. datum).

Channel.—Slightly shifting and affected by weeds.

Discharge measurements.—Made with current-meter by wading.

Observer.—Chester Torkelson.

Remarks.—Records for 1916 unreliable because of beaver dam in ditch; 1915 curve used as base for shifting conditions throughout season.

No daily records for 1916 prior to June 1—unable to secure services of an observer.

DISCHARGE MEASUREMENTS of Strong's ditch at East End, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 14.....	J. E. Caughey.....	10	3.90	0.72	0.85	2.8 ^h
June 13.....	do.....	13	9.40	1.03	1.32	9.7
July 7.....	do.....	14	12.40	0.80	1.55	9.9
July 20.....	do.....	13	12.80	2.11	1.65	2.7
Sept 29.....	L. B. P. Miles.....				Dry	Nil

^h Ditch partly shut off.

DAILY GAUGE HEIGHT AND DISCHARGE of Strong's ditch at East End, for 1916

DAY	June		July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	1.30	11.5	1.30	5.1	1.65	2.70	1.01	Nil	Dry	Nil
2.....	1.30	11.3	1.35	6.0	1.85	6.40	0.84	"	"	"
3.....	1.30	11.1	1.35	5.8	1.75	4.30	Dry	"	"	"
4.....	1.30	10.9	1.35	5.6	1.71	3.60	"	"	"	"
5.....	1.30	10.7	1.40	6.5	1.56	1.70	"	"	"	"
6.....	1.30	10.5	1.40	6.3	1.51	1.25	"	"	"	"
7.....	1.30	10.3	1.40	6.1	1.36	0.40	"	"	"	"
8.....	1.30	10.2	1.40	5.5	1.50	1.20	"	"	"	"
9.....	1.30	10.0	1.55	8.3	1.76	4.50	"	"	"	"
10.....	1.30	9.8	1.60	8.9	1.85	6.40	"	"	"	"
11.....	1.30	9.6	1.60	8.1	1.86	6.70	"	"	"	"
12.....	1.30	9.3	1.60	7.4	1.90	7.60	"	"	"	"
13.....	1.30	9.1	1.55	5.5	1.90	7.60	"	"	"	"
14.....	1.30	8.9	1.55	4.9	1.93	8.40	"	"	"	"
15.....	1.30	8.7	1.55	4.2	1.93	8.40	"	"	"	"
16.....	1.30	8.4	1.60	4.5	2.03	11.20	"	"	"	"
17.....	1.30	8.2	1.60	3.9	1.97	9.50	"	"	"	"
18.....	1.25	6.7	1.60	3.3	1.98	9.80	"	"	"	"
19.....	1.25	6.5	1.60	2.7	1.96	9.20	"	"	"	"
20.....	1.25	6.3	1.60	2.1	1.97	9.50	"	"	"	"
21.....	1.25	6.1	1.60	2.1	1.94	8.70	"	"	"	"
22.....	1.25	5.9	1.65	2.7	1.86	6.60	"	"	"	"
23.....	1.25	5.6	1.65	2.7	1.77	4.70	"	"	"	"
24.....	1.25	5.4	1.65	2.7	1.95	9.00	"	"	"	"
25.....	1.25	5.3	1.65	2.7	2.00	10.40	"	"	"	"
26.....	1.25	5.1	1.65	2.7	2.04	11.60	"	"	"	"
27.....	1.25	4.0	1.65	2.7	2.05	11.80	"	"	"	"
28.....	1.25	4.7	1.65	2.7	2.05	11.80	"	"	"	"
29.....	1.25	4.5	1.65	2.7	1.94	8.70	"	"	"	"
30.....	1.25	4.3	.....	2.7 ^a	1.75	4.30	"	"	"	"
31.....	.....	.....	1.65	2.7	1.35	0.35	.....	.....	"	"

^a Discharge estimated.

Discharge affected by beaver dams from July 20 to end of season.

MONTHLY DISCHARGE of Strong's ditch at East End, for 1916

MONTH	DISCHARGE IN SECOND-FEET				Total Discharge in Acre-ft.
	Maximum	Minimum	Mean	Per square Mile	
June.....	11.5	4.30	8.0	.....	476
July.....	8.9	2.10	4.5	.....	277
August.....	11.8	0.35	6.7	.....	412
September.....	Nil	Nil	Nil	.....	0
October.....	.....	.....	.....	.....	0
The period.....	.....	.....	.....	.....	1,165

FRENCHMAN RIVER AT EAST END

Location.—On the SE. $\frac{1}{2}$ Sec. 31, Tp. 6, Rge. 21, W. 3rd Mer., at the Canadian Pacific Railway bridge about one-half mile east of the East End depot.

Records available.—April 21, 1909, to October 31, 1916.

Gauge.—Vertical staff fastened to the downstream pile of the fifth bent from the west end of the bridge. The elevation of the zero of the gauge is 2,958.97 feet above sea-level.

Bench-mark.—On July 31, 1915, a permanent iron bench-mark was set on the left bank above high water mark, thirty feet from the edge of the cut-bank and near the gate on the R.N.W.M.P. grounds. Referred to the Canadian Pacific railway datum, the elevation is 2,975.19 feet above sea-level.

SESSIONAL PAPER No. 25B

Channel.—Permanent.

Discharge measurements.—Made with a current-meter by wading or from a bridge.

Winter flow.—Station not maintained in winter.

Artificial control.—A permanent control for the gauge was established during October, one-quarter mile down stream from the gauge at the bridge.

Diversions.—Mr. J. C. Strong diverts water for irrigation purposes about two miles up stream from this station. A small amount returns to the river channel, above the gauge.

Observer.—Byron Walters, Wm. Jas. Brummitt and C. Torkelson.

DISCHARGE MEASUREMENTS of Frenchman river at East End, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 20.....	M. H. French.....	106.0	62.9	2.57	5.28	162
Mar. 30.....	do.....	106.0	121.0	3.46	4.98	419
Mar. 31.....	do.....	55.0	258.5	1.59	3.96	412
April 1.....	do.....	55.0	245.0	1.58	3.73	387
April 3.....	do.....	68.0	101.9	2.72	3.21	278
April 8.....	do.....	61.0	74.0	2.22	2.66	164
May 6.....	J. E. Caughey.....	33.7	35.8	3.07	2.43	110
May 12.....	do.....	22.5	17.6	2.33	1.96	41
June 14.....	do.....	37.5	164.1	1.88	3.14	310
July 7.....	do.....	26.0	25.4	3.07	2.25	78
July 20.....	do.....	22.0	16.0	3.18	2.04	51
July 31.....	L. P. B. Miles.....	34.0	41.7	3.50	2.61	146
Aug. 26.....	do.....	20.5	13.1	2.45	1.83	32
Sept. 27.....	do.....	20.0	11.2	2.86	1.92	32
Nov. 4.....	do.....	24.0	17.2	2.97	2.03	51

DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman river at East End, for 1916

DAY	March		April		May		June	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			3.73	387 <i>d</i>	2.18	69	3.70	520
2.....			3.78	452	2.09	57	3.60	480
3.....			3.21	278 <i>d</i>	2.49	122	3.60	480
4.....			3.08	244	2.40	105	3.60	480
5.....			2.79	173	2.50	124	3.40	400
6.....			2.69	155	2.40	105	3.30	360
7.....			2.69	159	2.30	88	3.30	360
8.....			2.70	166	2.30	88	3.20	320
9.....			2.70	166	2.30	88	3.10	284
10.....			3.40	400	2.30	88	3.00	250
11.....			3.61	484	2.30	88	3.00	250
12.....			3.71	524	2.20	72	2.90	219
13.....			3.31	364	2.20	72	2.80	190
14.....			3.22	328	2.20	72	2.80	190
15.....			3.02	257	2.10	58	2.70	166
16.....			2.82	196	2.10	58	2.70	166
17.....			2.73	173	2.10	58	2.60	144
18.....			2.73	173	2.10	58	2.60	144
19.....	5.48	180 <i>e</i>	2.43	110	2.00	46	2.50	124
20.....	5.28	162 <i>d</i>	2.14	64	2.00	46	2.50	124
21.....	5.58	650 <i>e</i>	2.14	64	2.00	46	2.50	124
22.....	9.33	1,100 <i>e</i>	2.04	51	2.00	46	2.40	105
23.....	9.73	1,400 <i>e</i>	2.15	65	2.00	46	2.40	105
24.....	7.58	700 <i>e</i>	2.25	80	2.00	46	2.40	105
25.....	5.48	300 <i>e</i>	2.05	52	2.10	58	2.50	124
26.....	4.98	240 <i>e</i>	2.16	66	2.60	144	2.40	105
27.....	6.08	950 <i>e</i>	2.06	53	3.00	250	2.30	88
28.....	6.88	1,025 <i>e</i>	2.26	82	3.50	440	2.30	88
29.....	5.08	620 <i>e</i>	2.07	54	3.50	440	2.20	72
30.....	4.98	419 <i>d</i>	2.17	68	3.60	480	2.20	72
31.....	3.96	412 <i>d</i>			3.60	480		

e Discharge estimated.
d Actual measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman river at East End, for 1916.—*Concluded.*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	2.20	72	2.40	105	1.88	34	2.00	46
2.....	2.35	96	2.24	78	2.00	46	2.07	54
3.....	2.30	88	2.14	64	1.87	33	2.10	58
4.....	2.30	88	2.00	46	1.85	32	2.10	58
5.....	2.25	80	1.96	42	1.86	32	2.10	58
6.....	2.25	80	1.96	42	1.87	33	2.13	62
7.....	2.25	80	1.97	43	1.84	31	2.15	65
8.....	2.20	72	1.94	40	1.92	38	2.16	66
9.....	2.15	65	1.94	40	1.91	37	2.16	66
10.....	2.15	65	1.99	45	1.90	36	2.23	77
11.....	2.05	52	2.02	48	1.89	35	2.26	82
12.....	2.05	52	2.15	65	1.86	32	2.30	88
13.....	2.03	50	2.10	58	1.84	31	2.32	91
14.....	2.00	46	2.07	54	1.85	32	2.32	91
15.....	2.00	46	2.03	50	1.84	31	2.33	93
16.....	2.00	46	1.96	42	1.83	30	2.32	91
17.....	2.00	46	1.94	40	1.85	32	2.25	80
18.....	2.15	65	1.87	33	1.86	32	2.23	77
19.....	2.10	58	1.86	32	1.84	31	2.20	72
20.....	2.04	51	1.86	32	1.84	31	2.16	66
21.....	2.04	51	1.84	31	1.84	31	2.14	64
22.....	2.00	46	1.86	32	1.85	32	2.13	62
23.....	1.90	36	1.85	32	1.85	32	2.12	61
24.....	1.90	36	1.86	32	1.84	31	2.10	58
25.....	2.00	46	1.81	28	1.86	32	2.12	61
26.....	2.10	58	1.84	31	1.86	32	2.11	59
27.....	2.00	46	1.84	31	1.87	33	2.12	61
28.....	3.30	360	1.84	31	1.96	42	2.11	59
29.....	2.96	237	1.86	32	1.97	43	2.10	58
30.....	.....	181 ^e	1.85	32	1.98	44	2.13	62
31.....	2.61	146	1.87	33	.....	.....	2.12	61

^e Discharge estimated.

MONTHLY DISCHARGE of Frenchman river at East End, for 1916

(Drainage area 648 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (19-31).....	1,400	162	627	0.968	0.47	16,163
April.....	524	51	196	0.302	0.34	11,663
May.....	480	46	130	0.201	0.23	7,993
June.....	520	72	221	0.341	0.38	13,150
July.....	360	36	82	0.127	0.15	5,042
August.....	105	28	43	0.066	0.08	2,644
September.....	46	30	34	0.052	0.06	2,023
October.....	93	46	68	0.105	0.12	4,181
The period.....	.....	.....	.....	.....	1.83	62,859

Discharge of approximately 50 second-feet per day continued during first part of November.

SESSIONAL PAPER No. 25a

MEAN MONTHLY DISCHARGE of Frenchman river at East End

(Area of watershed 648 square miles)

(Average run-off per square mile 73.3 acre-feet.)

YEAR	Mar. Sec.-ft.	April Sec.-ft.	May Sec.-ft.	June Sec.-ft.	July Sec.-ft.	Aug. Sec.-ft.	Sept. Sec.-ft.	Oct. Sec.-ft.	Nov. Sec.-ft.	Total Acre-ft.	Remarks
1909..	.....	554a	235	205	143	33	21	41	.....	46,789	a Records incomplete; omitted from averages.
1910..	.....	54a	39	21	6	5	7	10	.....	6,854a	
1911..	.....	401	83	53	37	22	21	32	.....	38,967	b Records at Phillips' ranch for 1913 used.
1912..	.....	523c	173	59	54	22	27	17	27a	39,760	c Reduced to monthly average.
1913..	.....	443bc	55	36	24	14c	13	17	.....	31,625b	
1914..	50c	247	36	28	8	3	9	27	.....	24,578	Small flow during winter months
1915..	28c	352	57	91	73	33	31	26	.....	41,541	Records include Enright & Strong diversions.
1916..	263c	196	130	221	82	43	34	68	.....	62,859	
Av. Sec.-ft	114	360	101	89	53	22	20	29	.....	40,874	
Av. Ac.-ft	7,010	21,421	6,210	5,296	3,259	1,353	1,190	1,783	.....	47,522	

MORRISON BROTHERS' DITCH FROM FRENCHMAN RIVER

Location.—On the SW. $\frac{1}{4}$ Sec. 26, Tp. 6, Rge. 21, W. 3rd Mer., about three miles down stream from East End.

Records available.—June 12 to August 28, 1913; May 25 to October 30, 1914, and May 12 to June 27, 1915.

Gauge.—Vertical staff fastened to a post at the right bank about one-half mile from the headgate; the elevation of the zero of the gauge has been maintained at 97.24 feet since establishment.

Bench-mark.—Permanent iron bench-mark located on the right bank near the gauge; assumed elevation 100.00 feet.

Channel.—Slightly grown with weeds.

Discharge measurements.—Made with current-meter.

Observer.—A. A. Morrison.

Remarks.—No water used during 1916.

MULE CREEK AT GUNN'S RANCH

Location.—On the SW. $\frac{1}{4}$ Sec. 33, Tp. 5, Rge. 17, W. 3rd Mer., prior to June 16, 1916, and on the NE. $\frac{1}{4}$ Sec. 33, Tp. 5, Rge. 17, W. 3rd Mer., since that date.

Records available.—April 15, 1914, to November 8, 1916.

Gauge.—Vertical staff; zero elevation has been maintained at 92.46 feet since establishment. High water staff installed August 4, 1916; zero elevation 95.46 feet

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Discharge measurements.—Made with current-meter at high stages, and with weir at low stages.

Channel.—Probably permanent.

Winter flow.—This station is not maintained during the winter.

Diversions.—There is no diversion above this station.

Observer.—Wm. Gunn, Jr.

Remarks.—Staff gauge carried out with ice about March 12, 1916, when creek began to flow. March 25, maximum reading 6.34 feet. Creek remained high one week, dropping to three feet level April 3, and after April 10 dropped gradually to 1.19 feet on April 27, when new gauge was set.

Flood on July 4, with maximum gauge height 9.40 feet, carried out gauge. New gauge set August 4.

DISCHARGE MEASUREMENTS of Mule creek at Gunn's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 27.....	J. E. Caughey.....	2.3	0.99	0.55	1.19	0.55
May 17.....	do.....	2.5	2.52	0.70	1.59	1.77
June 2.....	do.....	2.4	2.11	0.59	1.44	1.25
June 16.....	do.....				1.09	0.62 ^w
June 27.....	do.....				1.08	0.58 ^w
Aug. 4.....	L. B. P. Miles.....				1.08	0.21 ^w
Aug. 18.....	do.....				1.02	0.19 ^w
Sept. 21.....	do.....				0.94	0.18 ^w
Nov. 11.....	do.....				1.05	0.31 ^w

^w Weir measurements.

DAILY GAUGE HEIGHT AND DISCHARGE of Mule creek at Gunn's ranch, for 1916

DAY	August		September		October		November	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....		0.40 _e	0.97	0.22	1.20	0.60	1.14	0.48
2.....		0.38 _e	0.99	0.24	2.00	4.20	1.15	0.50
3.....		0.37 _e	1.02	0.28	2.60	9.80	1.17	0.54
4.....	1.08	0.37	1.04	0.31	2.60	9.80	1.16	0.52
5.....	1.09	0.38	0.99	0.24	2.80	12.30	1.18	0.56
6.....	1.11	0.42	0.97	0.22	2.83	12.70	1.16	0.52
7.....	1.08	0.37	0.98	0.23	2.00	4.20	1.15	0.50
8.....	1.10	0.40	1.00	0.25	1.80	2.90	1.20	0.60
9.....	3.30	20.00	0.99	0.24	1.60	1.85		
10.....	2.50	8.70	1.01	0.26	1.45	1.28		
11.....	1.85	3.20	1.03	0.30	1.25	0.72		
12.....	1.60	1.85	1.01	0.26	1.17	0.54		
13.....	1.35	0.96	0.99	0.24	1.13	0.46		
14.....	1.15	0.50	0.97	0.22	1.11	0.42		
15.....	1.12	0.44	0.98	0.23	1.12	0.44		
16.....	1.10	0.40	1.00	0.25	1.10	0.40		
17.....	1.08	0.37	1.01	0.26	1.08	0.37		
18.....	1.02	0.28	1.00	0.25	1.07	0.36		
19.....	1.01	0.26	0.99	0.24	1.06	0.38		
20.....	0.98	0.23	0.96	0.21	1.11	0.42		
21.....	0.97	0.22	0.94	0.19	1.13	0.46		
22.....	0.99	0.24	0.92	0.17	1.12	0.44		
23.....	1.01	0.26	0.94	0.19	1.14	0.48		
24.....	1.04	0.31	0.96	0.21	1.11	0.42		
25.....	1.07	0.36	0.98	0.23	1.10	0.40		
26.....	1.06	0.34	1.00	0.25	1.08	0.37		
27.....	1.04	0.31	1.05	0.32	1.06	0.34		
28.....	1.03	0.30	1.09	0.38	1.09	0.38		
29.....	1.01	0.26	1.15	0.50	1.11	0.42		
30.....	0.98	0.23	1.25	0.72	1.13	0.46		
31.....	0.97	0.22			1.14	0.48		

_e Discharge estimated.

SESSIONAL PAPER No. 25b

MONTHLY DISCHARGE of Mule creek at Gunn's ranch, for 1916

(Drainage area 60 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
August.....	20.00	0.22	1.40	0.023	0.03	86
September.....	0.72	0.17	0.27	0.004	0.00	16
October.....	12.70	0.34	2.20	0.037	0.04	135
November.....	0.60	0.48	0.53	0.009	0.00	8
The period.....					0.07	245

Daily records, April 27 to July 31, unreliable, not published.

BATE CREEK AT BATE'S RANCH

Location.—On SW. $\frac{1}{4}$ Sec. 7, Tp. 6, Rge. 16, W. 3rd Mer., near Nummola post office.*Records available.*—Open water flow from April 15, 1915, to October 31, 1916.*Gauge.*—Vertical staff fastened to a post on right bank about one-quarter mile from Mr. Bate's house; the elevation of the zero maintained at 94.87 feet in 1914, 92.77 feet in 1915, 92.27 feet to August 4, 1916, and 89.74 feet at a new section from August 5 to October 31, 1916.*Bench-mark.*—Wooden plug driven in the right bank, 100 feet from the gauge; assumed elevation 100.00 feet.*Channel.*—Probably permanent.*Discharge measurements.*—Made with current-meter and weir.*Diversions.*—Mr. Bate diverts water for irrigation purposes above the gauge.*Observer.*—A. E. Bate.*Remarks.*—Flood of July 2-3 scoured out creek bottom at gauge, necessitating its re-establishment at a new section.

Creek continued to flow small trickle during first part of November.

DISCHARGE MEASUREMENTS of Bate creek at Bate's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 26.....	J. E. Caughey.....	.....	.....	.....	1.50	0.42w
May 17.....	do.....	.....	.....	.....	1.54	0.62w
June 2.....	do.....	.....	.....	.....	1.55	0.71w
June 17.....	do.....	.....	.....	.....	1.51c	0.53w
June 27.....	do.....	.....	.....	.....	1.37c	0.29w
Aug. 5.....	L. B. P. Miles.....	.....	.....	.....	0.25p	0.27w
Aug. 5.....	do.....	.....	.....	.....	0.60f	0.27w
Aug. 18.....	do.....	.....	.....	.....	0.54	0.10w
Sept. 21.....	do.....	.....	.....	.....	0.65	0.18w
Nov. 11.....	do.....	.....	.....	.....	0.55	0.07w

w Discharge determined by using a 24-inch weir.

c Gauge height affected by backwater from vegetation.

p Gauge height affected by scour from flood of July 2.

f Staff gauge re-established at new section.

DAILY GAUGE HEIGHT AND DISCHARGE of Bate creek at Bate's ranch, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1			2.01	2.90	1.44	0.38	1.60	0.80
2			1.74	1.36	1.48	0.46	1.51	0.53
3			1.62	0.88	1.46	0.42	1.46	0.42
4			1.66	1.04	1.52	0.56	1.52	0.56
5			1.75	1.40	1.48	0.46	1.96	2.50
6			1.73	1.32	1.48	0.46	1.59	0.77
7			1.77	1.48	1.44	0.38	1.48	0.46
8			1.86	1.90	1.43	0.36	1.48	0.46
9			1.72	1.28	1.44	0.38	1.51	0.53
10	3.81 ^b	20.00 ^e	1.80	1.60	1.50	0.50	1.84	1.80
11	4.20	70.00 ^e	1.81	1.65	1.48	0.46	1.55	0.65
12	3.98 ^b	20.00 ^e	1.88	2.00	1.50	0.50	1.48	0.46
13	2.25	5.10	1.86	1.90	1.50	0.50	1.48	0.46
14	1.38	0.27	1.76	1.44	1.49	0.48	1.48	0.46
15	1.13	0.02	1.74	1.36	1.56	0.68	1.46	0.42
16	1.12	0.01	1.72	1.28	1.73	1.32	1.44	0.38
17	1.15	0.02	1.66	1.04	1.54	0.62	1.49	0.48
18	1.18	0.04	1.66	1.04	1.50	0.50	1.40	0.30
19	1.33	0.20	1.66	1.04	1.48	0.46	1.39	0.28
20	1.95	2.40	1.58	0.74	1.48	0.46	1.38	0.27
21	4.10	118.00	1.55	0.65	1.50	0.50	1.46	0.42
22	1.53	0.59	1.54	0.62	1.49	0.48	1.98	2.70
23	1.29	0.14	1.52	0.56	1.52	0.56	1.56	0.68
24	1.25	0.10	1.50	0.50	1.50	0.50	1.49	0.48
25	1.40	0.30	1.51	0.53	2.40	6.40	1.38	0.27
26	2.20	4.40	1.50	0.50	2.20	4.40	1.34	0.21
27	2.60	9.30	1.44	0.38	1.69	1.16	1.38	0.27
28	2.68	10.80	1.44	0.38	1.69	1.16	1.39	0.28
29	2.52	8.00	1.48	0.46	1.68	1.12	1.75	1.40
30	2.58	9.00	1.46	0.42	1.74	1.36	1.55	0.65
31	2.50	7.70			1.62	0.88		

b-b Ice conditions.

e Discharge estimated.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Bate creek at Bate's ranch, for 1916.—*Concluded.*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	1.32	0.18	0.25	0.26	0.54	0.08	0.69	0.41
2.....	3.30	46.00	0.25	0.26	0.52	0.06	0.72	0.51
3.....	3.55 ^p	119.00 _e	0.25	0.26	0.54	0.08	0.74	0.58
4.....	0.76	2.10	0.25 ^p	0.26	0.61	0.20	0.75	0.62
5.....	0.57	1.16	0.58 ^f	0.14	0.58	0.14	0.75	0.62
6.....	0.91	3.00	0.58	0.14	0.58	0.14	0.80	0.82
7.....	0.49	0.84	0.56	0.11	0.57	0.13	0.76	0.66
8.....	0.37	0.48	0.57	0.13	0.57	0.13	0.74	0.58
9.....	0.39	0.53	0.63	0.25	0.63	0.25	0.74	0.58
10.....	0.34	0.42	0.62	0.22	0.63	0.25	0.72	0.51
11.....	0.33	0.40	0.62	0.22	0.58	0.14	0.72	0.51
12.....	0.31	0.36	0.62	0.22	0.58	0.14	0.72	0.51
13.....	0.31	0.36	0.59	0.16	0.64	0.27	0.71	0.48
14.....	0.31	0.36	0.58	0.14	0.58	0.14	0.70	0.44
15.....	0.31	0.36	0.56	0.11	0.63	0.25	0.70	0.44
16.....	0.30	0.34	0.56	0.11	0.64	0.27	0.70	0.44
17.....	0.29	0.32	0.53	0.07	0.64	0.27	0.71	0.48
18.....	0.89	2.90	0.51	0.05	0.64	0.27	0.74	0.58
19.....	0.31	0.36	0.50	0.04	0.64	0.27	0.71	0.48
20.....	0.27	0.28	0.52	0.06	0.63	0.25	0.72	0.51
21.....	0.25	0.26	0.52	0.06	0.64	0.27	0.73	0.55
22.....	0.25	0.26	0.52	0.06	0.65	0.29	0.71	0.48
23.....	0.25	0.26	0.52	0.06	0.64	0.27	0.70	0.44
24.....	0.27	0.28	0.53	0.07	0.65	0.29	0.71	0.48
25.....	0.27	0.28	0.57	0.13	0.66	0.32	0.71	0.48
26.....	0.27	0.28	0.56	0.11	0.66	0.32	0.71	0.48
27.....	0.34	0.42	0.54	0.08	0.76	0.66	0.73	0.55
28.....	0.27	0.28	0.53	0.07	0.70	0.44	0.71	0.48
29.....	0.36	0.46	0.52	0.06	0.70	0.44	0.70	0.44
30.....	0.28	0.30	0.52	0.06	0.68	0.38	0.70	0.44
31.....	0.27	0.28	0.54	0.08	.....	.....	0.70	0.44

^p Gauge heights July 3 to August 4 affected by scour from flood July 2.^f Staff gauge re-established at new section.^e Discharge estimated.

MONTHLY DISCHARGE of Bate creek at Bate's ranch, for 1916

(Drainage area 12 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (10-31).....	118.00	0.01	13.00	1.080	0.88	567
April.....	2.90	0.38	1.12	0.093	0.10	67
May.....	6.40	0.36	0.93	0.078	0.09	57
June.....	2.70	0.21	0.68	0.057	0.06	40
July.....	119.00	0.18	5.90	0.492	0.57	363
August.....	0.26	0.04	0.13	0.011	0.01	8
September.....	0.66	0.06	0.25	0.021	0.02	15
October.....	0.82	0.41	0.52	0.043	0.05	32
The period.....					1.78	1,149

Small flow continued during first part of November.

FRENCHMAN RIVER AT "76" RANCH

Location.—On the SE. $\frac{1}{4}$ of Sec. 27, Tp. 5, Rge. 16, W. 3rd Mer., at the "76" ranch near Waldville post office.

Records available.—April 10, 1914, to October 11, 1915.

Gauge.—Vertical staff; zero elevation has been maintained at 87.95 feet during 1914 and 1915, and at elevation 88.66 feet during 1916.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Probably permanent.

Discharge measurements.—Made by wading or from cable.

Winter flow.—Station not maintained during winter.

Diversions.—Messrs. Enright and Strong and Messrs. Morrison Brothers, Duncan and Watson, divert water from the stream some fifty miles above the station.

Observers.—Mrs. Hazelle MacDonald and T. P. Nash.

DISCHARGE MEASUREMENTS of Frenchman river at "76" ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 25.....	J. E. Caughey.....	63.0	82.6	2.17	3.36	180
May 17.....	do.....	61.0	59.4	1.75	2.83	104
June 2.....	do.....	55.0	190.0	2.01	4.13	381
June 17.....	do.....	64.0	100.9	2.17	3.43	219
June 27.....	do.....	64.0	95.0	2.33	3.53	221
Aug. 5.....	L. B. P. Miles.....	64.0	49.5	1.74	2.70	86
Aug. 6.....	do.....	62.5	48.5	1.71	2.59	83
Aug. 17.....	do.....	59.0	51.0	1.43	2.53	73
Sept. 9.....	do.....	41.0	25.8	1.43	2.27	37
Sept. 20.....	do.....	40.5	22.3	1.49	2.20	33
Nov. 13.....	do.....	35.0	56.2	0.66	2.56	37½

i Stream frozen over.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman river at "76" ranch, for 1916

DAY	April		May		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1			3.16	156	4.26	420	3.30	180
2			3.28	176	4.08	366	3.35	189
3			3.18	159	3.78	282	10.90	2,412
4			3.08	143	3.55	229	5.32	738
5			3.00	130	3.34	187	3.43	205
6			3.00	130	3.33	185	4.15	387
7			3.08	143	3.19	160	4.10	372
8			3.08	143	3.07	141	3.47	213
9			3.00	130	3.62	243	3.21	164
10			2.95	122	3.94	325	2.90	115
11			3.00	130	3.52	223	2.80	101
12			3.12	149	3.25	171	2.78	98
13			3.00	130	3.10	146	2.70	87
14			2.85	108	3.54	227	2.70	87
15			2.87	111	4.16	390	2.66	81
16			2.82	104	3.82	292	2.60	74
17			2.82	104	3.46	211	2.55	68
18			2.80	101	3.30	180	2.50	62
19			2.74	93	3.10	146	3.49	217
20			2.73	91	2.98	127	3.90	314
21			2.68	84	2.82	104	3.25	171
22			2.71	88	2.84	107	2.40	51
23			2.67	83	2.86	109	2.40	51
24			2.55	68	2.84	107	2.62	76
25	3.36	191	2.93	119	2.82	104	2.52	64
26	3.35	189	3.28	176	3.20	162	2.50	62
27	3.30	180	3.30	180	3.48	215	2.50	62
28	3.20	162	3.35	189	3.38	195	2.45	56
29	3.14	152	3.78	282	3.30	180	2.82	104
30	3.10	146	4.18	396	3.30	180	3.44	55
31			4.20	402			3.82	292

DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman river at "76" ranch, for 1916—*Concluded*

DAY	August		September		October		November	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	3.02	133	.....	38.0e	2.22	34	2.49	61
2.....	3.00	130	.....	38.0e	2.32	43	2.49	61
3.....	2.96	124	.....	38.0e	2.41	52	2.49	61
4.....	2.95	122	.....	37.0e	2.50	51	2.49	61
5.....	2.72	90	.....	37.0e	2.66	81	2.47	58
6.....	2.68	84	.....	37.0e	2.63	78	2.46	57
7.....	2.65	80	.....	37.0e	2.55	68	2.45	56
8.....	2.64	79	2.26	37.0	2.52	64	2.45	56
9.....	3.04	136	2.28	39.0	2.50	62	2.46	57
10.....	2.99	128	2.32	43.0	2.49	61	2.46	57
11.....	2.69	86	2.32	43.0	2.52	64	2.47	58
12.....	2.64	79	2.30	41.0	2.64	79	.....	.....
13.....	2.65	80	2.30	41.0	2.68	84	.....	.....
14.....	2.61	75	2.29	40.0	2.68	84	.....	.....
15.....	2.58	72	2.28	39.0	2.68	84	.....	.....
16.....	2.58	72	2.25	36.0	2.71	88	.....	.....
17.....	2.56	69	2.24	35.0	2.75	94	.....	.....
18.....	2.51	63	2.23	34.0	2.75	94	.....	.....
19.....	2.50	62	2.23	34.0	2.74	93	.....	.....
20.....	2.49	61	2.22	34.0	2.68	84	.....	.....
21.....	2.40	51	2.20	32.0	2.64	79	.....	.....
22.....	2.31	42	2.20	32.0	2.62	78	.....	.....
23.....	2.29	40	2.20	32.0	2.60	74	.....	14,327
24.....	.....	40e	2.20	32.0	2.58	72	.....	.....
25.....	.....	40e	1.99	16.4	2.52	64	.....	.....
26.....	.....	40e	1.99	16.4	2.54	67	.....	.....
27.....	.....	39e	2.21	33.0	2.54	67	.....	.....
28.....	.....	39e	2.23	34.0	2.53	66	.....	.....
29.....	.....	39e	2.23	34.0	2.53	66	.....	.....
30.....	.....	39e	2.23	34.0	2.52	64	.....	.....
31.....	.....	38e	.....	.....	2.50	62	.....	.....

e Discharge estimated.

MONTHLY DISCHARGE of Frenchman river at "76" ranch, for 1916

(Drainage area 1,106 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-ft.
April (25-30).....	191	146.0	170	0.154	0.03	2,023
May.....	402	68.0	149	0.135	0.16	9,162
June.....	420	104.0	204	0.184	0.21	12,139
July.....	2,412	51.0	233	0.211	0.24	14,327
August.....	136	38.0	73	0.066	0.08	4,489
September.....	43	16.4	35	0.032	0.04	2,083
October.....	94	34.0	71	0.064	0.07	4,366
November (1-11).....	61	56.0	58	0.052	0.02	1,265
The period.....	.....	.....	.....	.....	0.85	49,854

SNAKE CREEK NEAR VAL MARIE

Location.—On SW. $\frac{1}{4}$ Sec. 16, Tp. 4, Rge. 13, W. 3rd Mer., about one-half mile east of Val Marie post office.

Records available.—April 7, 1914, to October 31, 1916.

Gauge.—Vertical staff; zero elevation has been maintained at 87.91 feet since establishment.

SESSIONAL PAPER No. 25b

Bench-mark.—Permanent iron bench-mark located three feet north of the east tower of the cable; assumed elevation 100.00 feet.

Channel.—Permanent.

Discharge measurements.—Made with a current-meter from cable in flood stages, by wading at ordinary stages and with a weir at low stages.

Observer.—Jean Denniel.

DISCHARGE MEASUREMENTS of Snake creek near Val Marie, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 24.....	J. E. Caughey.....	6.0	8.40	1.40	2.25	11.80
May 18.....	do.....	5.5	2.75	0.87	0.97	2.40
May 31.....	do.....	14.0	18.80	1.12	2.54	21.00
June 19.....	do.....	2.8	2.09	1.39	1.35	2.90
June 26.....	do.....	7.6	6.57	1.05	1.95	6.90
Aug. 7.....	L. B. P. Miles.....				1.00	1.12 ^w
Aug. 15.....	do.....	3.2	1.20	0.75	0.92	0.90
Sept. 9.....	do.....				0.76	0.46
Sept. 16.....	do.....				0.74	0.45
Nov. 14.....	do.....				0.66	0.42

^w Discharge determined by using a 24-inch weir.

DAILY GAUGE HEIGHT AND DISCHARGE of Snake creek near Val Marie, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			9.30	300.0e	1.47	3.40	2.52	20.0
2.....			8.80 ^b	273.0e	1.41	3.00	2.27	12.4
3.....			7.60 ^g	273.0e	1.32	2.50	2.02	7.9
4.....			6.45	216.0e	1.25	2.20	1.93	6.6
5.....			5.40 ^g	163.0e	1.16	1.82	1.81	5.6
6.....			4.77	110.0	1.12	1.66	1.80	5.6
7.....			4.57	102.0	1.07	1.47	1.67	4.6
8.....			5.67	146.0	1.01	1.26	1.78	5.4
9.....			5.92	156.0	0.97	1.14	1.89	6.4
10.....			6.92	196.0	0.91	0.98	2.00	7.6
11.....			6.72	188.0	0.88	0.90	2.11	9.3
12.....			6.82	192.0	0.84	0.80	2.70	27.0
13.....			5.72	148.0	0.82	0.75	2.40	15.9
14.....			5.62	144.0	0.80	0.70	2.04	8.2
15.....			5.42	136.0	0.80	0.70	1.85	6.0
16.....			4.92	116.0	0.94	1.05	1.68	4.7
17.....			3.92	76.0	0.92	1.00	1.55	3.8
18.....			3.62	64.0	0.97	1.14	1.50	3.5
19.....			3.47	58.0	0.93	1.03	1.30	2.5
20.....			3.23	49.0	0.88	0.90	1.20	2.0
21.....			2.92	36.0	0.85	0.82	1.20	2.0
22.....			2.17	10.3	0.82	0.75	1.35	2.7
23.....			2.46	18.0	0.80	0.70	1.37	2.8
24.....			2.25	11.9	0.78	0.66	1.70	4.8
25.....			2.00	7.6	1.25	2.20	2.03	8.0
26.....	7.40 ^b	50e	1.80	5.6	4.15	85.00	1.99	7.5
27.....	6.30	100e	1.64	4.4	3.97	78.00	1.70	4.8
28.....	7.15	100e	1.57	4.0	3.55	61.00	1.72	5.0
29.....	9.55	200e	1.55	3.8	2.88	35.00	1.62	4.3
30.....	11.00	300e	1.55	3.8	2.65	25.00	5.57	142.0
31.....	11.00	300e			2.54	21.00		

b-b Ice conditions.

e Discharge estimated.

g Ice going out April 3-5.

DAILY GAUGE HEIGHT AND DISCHARGE of Snake creek near Val Marie, for 1916.—*Concluded.*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	4.07	82.00	2.38	15.30	0.70	0.52	0.87	0.87
2	3.36	54.00	2.15	10.00	0.71	0.54	0.87	0.87
3	7.40	215.00	1.78	5.40	0.71	0.54	0.88	0.90
4	6.35	173.00	1.65	4.50	0.74	0.58	0.88	0.90
5	4.02	80.00	1.34	2.70	0.75	0.60	0.88	0.90
6	3.77	70.00	1.16	1.82	0.74	0.58	0.92	1.00
7	4.03	81.00	1.08	1.51	0.75	0.60	0.92	1.00
8	3.37	54.00	1.00	1.23	0.73	0.57	0.91	0.98
9	7.60	223.00	1.01	1.26	0.70	0.52	0.90	0.95
10	4.78	111.00	1.01	1.26	0.79	0.68	0.90	0.95
11	3.51	60.00	0.97	1.14	0.77	0.64	0.83	0.77
12	2.97	38.00	0.95	1.08	0.75	0.60	0.77	0.64
13	2.82	32.00	0.95	1.08	0.71	0.54	0.74	0.58
14	2.37	15.00	0.91	0.98	0.70	0.52	0.73	0.57
15	2.21	11.10	0.92	1.00	0.72	0.55	0.71	0.54
16	2.01	7.70	0.87	0.87	0.74	0.58	0.70	0.52
17	1.70	4.80	0.83	0.77	0.74	0.58	0.70	0.52
18	1.98	7.40	0.78	0.66	0.75	0.60	0.70	0.52
19	1.98	7.40	0.74	0.58	0.77	0.64	0.70	0.52
20	1.79	5.50	0.71	0.54	0.79	0.68	0.70	0.52
21	1.68	4.70	0.70	0.52	0.77	0.64	0.69	0.51
22	1.50	3.50	0.75	0.60	0.74	0.58	0.69	0.51
23	1.38	2.90	0.70	0.52	0.74	0.58	0.69	0.51
24	1.20	2.00	0.70	0.52	0.75	0.60	0.68	0.49
25	1.12	1.66	0.70	0.52	0.78	0.66	0.67	0.48
26	1.09	1.54	0.71	0.54	0.80	0.70	0.67	0.48
27	1.07	1.47	0.70	0.52	0.83	0.77	0.67	0.48
28	1.01	1.26	0.69	0.51	0.84	0.80	0.66	0.46
29	1.08	1.51	0.67	0.48	0.85	0.82	0.66	0.46
30	1.76	5.20	0.68	0.49	0.86	0.85	0.65	0.45
31	1.65	4.50	0.68	0.49			0.65	0.45

MONTHLY DISCHARGE of Snake creek near Val Marie, for 1916

(Drainage area 188 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (26-31)	300.00	50.00	175.00	0.931	0.210	2,082
April	300.00	3.80	107.00	0.569	0.630	6,367
May	85.00	0.70	10.90	0.058	0.070	670
June	142.00	2.00	11.60	0.062	0.070	690
July	223.00	1.26	44.00	0.234	0.270	2,705
August	15.30	0.48	1.90	0.010	0.010	117
September	0.85	0.52	0.62	0.003	0.003	37
October	1.00	0.45	0.64	0.003	0.003	39
The period					1.266	12,707

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Snake creek near Val Marie, for 1915

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1			4.37	94.00	0.57	0.37	0.92	1.00
2			5.89	155.00	0.57	0.37	0.90	0.95
3			6.87	194.00	0.57	0.37	0.89	0.92
4			5.39	135.00	0.58	0.38	0.88	0.90
5			4.11	84.00	0.59	0.39	0.81	0.72
6			3.50	59.00	0.60	0.40	0.69	0.51
7			3.09	43.00	0.59	0.39	0.65	0.45
8			2.57	22.00	0.59	0.39	0.67	0.48
9			2.12	9.40	0.58	0.38	0.65	0.45
10			1.79	5.50	0.58	0.38	0.63	0.43
11			1.52	3.70	0.58	0.38	0.60	0.40
12			1.32	2.60	0.58	0.38	0.59	0.39
13			1.11	1.62	0.59	0.39	0.59	0.39
14			1.01	1.26	0.62	0.42	0.63	0.43
15			0.99	1.20	0.65	0.45	0.60	0.40
16			0.87	0.87	0.69	0.51	0.57	0.37
17			0.85	0.82	0.67	0.48	0.65	0.45
18			0.82	0.75	0.66	0.46	0.61	0.41
19			0.79	0.68	0.62	0.42	0.62	0.42
20			0.72	0.55	0.59	0.39	0.65	0.45
21			0.72	0.55	0.57	0.37	0.71	0.54
22	1.37	2.8	0.71	0.54	0.59	0.39	0.72	0.55
23	1.42	3.1	0.72	0.55	0.57	0.37	0.75	0.60
24	3.52	60.0	0.72	0.55	0.55	0.35	0.76	0.62
25	3.69	67.0	0.69	0.51	0.54	0.34	0.70	0.52
26	3.37	54.0	0.67	0.48	0.69	0.51	0.67	0.48
27	3.33	53.0	0.65	0.45	0.75	0.60	0.68	0.49
28	3.37	54.0	0.63	0.43	0.75	0.60	0.69	0.51
29	2.92	36.0	0.61	0.41	0.70	0.52	0.68	0.49
30	3.27	50.0	0.61	0.41	0.96	1.11	0.68	0.49
31	4.27	90.0			0.95	1.08		

DAILY GAUGE HEIGHT AND DISCHARGE of Snake creek near Val Marie, for 1915.—*Concluded.*

MONTH	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	0.64	0.44	0.57	0.37	0.44	0.24	0.65	0.45
2.....	0.65	0.45	0.56	0.36	0.45	0.25	0.66	0.46
3.....	0.65	0.45	0.57	0.37	0.45	0.25	0.75	0.60
4.....	0.66	0.46	0.57	0.37	0.45	0.25	0.74	0.58
5.....	0.63	0.43	0.55	0.35	0.45	0.25	0.73	0.57
6.....	0.61	0.41	0.53	0.33	0.45	0.25	0.70	0.52
7.....	0.60	0.40	0.51	0.31	0.47	0.27	0.68	0.49
8.....	0.64	0.44	0.52	0.32	0.51	0.31	0.65	0.45
9.....	0.62	0.42	0.51	0.31	0.52	0.32	0.65	0.45
10.....	0.61	0.41	0.50	0.30	0.53	0.33	0.64	0.44
11.....	0.60	0.40	0.48	0.28	0.56	0.36	0.64	0.44
12.....	0.59	0.39	0.46	0.26	0.59	0.39	0.64	0.44
13.....	0.57	0.37	0.47	0.27	0.63	0.43	0.63	0.43
14.....	0.55	0.35	0.46	0.26	0.66	0.46	0.63	0.43
15.....	0.58	0.38	0.46	0.26	0.65	0.45	0.62	0.42
16.....	0.60	0.40	0.46	0.26	0.64	0.44	0.62	0.42
17.....	0.62	0.42	0.45	0.25	0.65	0.45	0.63	0.43
18.....	0.79	0.68	0.46	0.26	0.65	0.45	0.63	0.43
19.....	0.79	0.68	0.47	0.27	0.65	0.45	0.64	0.44
20.....	0.76	0.62	0.48	0.28	0.64	0.44	0.63	0.43
21.....	0.73	0.57	0.47	0.27	0.62	0.42	0.64	0.44
22.....	0.69	0.51	0.47	0.27	0.61	0.41	0.62	0.42
23.....	0.64	0.44	0.46	0.26	0.61	0.41	0.60	0.40
24.....	0.63	0.43	0.46	0.26	0.60	0.40	0.60	0.40
25.....	0.63	0.43	0.45	0.25	0.59	0.39	0.59	0.39
26.....	0.61	0.41	0.45	0.25	0.59	0.39	0.58	0.38
27.....	0.60	0.40	0.45	0.25	0.60	0.40	0.58	0.38
28.....	0.58	0.38	0.44	0.24	0.64	0.44	0.57	0.37
29.....	0.58	0.38	0.44	0.24	0.65	0.45	0.56	0.36
30.....	0.59	0.39	0.44	0.24	0.65	0.45	0.57	0.37
31.....	0.57	0.37	0.44	0.24	.....	.....	0.59	0.39

MONTHLY DISCHARGE of Snake creek near Val Marie, for 1915

(Drainage area 188 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (22-31).....	90.00	2.80	47.00	0.250	0.09	932
April.....	194.00	0.41	27.00	0.144	0.16	1,607
May.....	1.11	0.34	0.46	0.002	0.00	28
June.....	1.00	0.37	0.54	0.003	0.00	32
July.....	0.68	0.35	0.44	0.002	0.00	27
August.....	0.37	0.24	0.28	0.001	0.00	17
September.....	0.46	0.24	0.37	0.002	0.00	22
October.....	0.60	0.36	0.44	0.002	0.00	27
The period.....	.....	.....	.....	.....	0.25	2,692

SESSIONAL PAPER No. 25B

BIGBREED CREEK NEAR BUZZARD'S RANCH

Location.—On the SE. $\frac{1}{4}$ Sec. 15, Tp. 2, Rge. 11, W. 3rd Mer., about one and one-quarter miles from the junction with Frenchman river. During 1915 and 1916 located on NW. $\frac{1}{4}$ Sec. 3, Tp. 2, Rge. 11, W. 3rd Mer.

Records available.—March 23, 1914, to October 31, 1915. Discharge measurements only during 1916.

Gauge.—Vertical staff; zero elevation maintained at 92.48 during 1916. At former station maintained at 95.42 feet.

Bench-mark.—Permanent iron bench-mark, assumed elevation 100.00 feet.

Channel.—Slightly shifting.

Discharge measurements.—Made with current-meter or weir.

Gauge heights.—No records available during 1916, except engineer's readings during the spring run-off.

Winter flow.—Station not maintained during winter.

Observer.—No observer available during 1916.

DISCHARGE MEASUREMENTS of Bigbreed creek near Buzzard's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 7.....	J. E. Caughey	35 0	52 95	1 36	2 85	72 00
April 17.....	do	31 0	43 95	1 47	2 68	65 00
April 21.....	do	20 0	20 90	1 29	1 81	27 00
May 20.....	do	12 5	9 05	0 41	1 17	3 70
May 29.....	do	18 0	16 80	1 08	1 56	18 20
June 20.....	do	9 5	6 95	0 33	1 04	2 30
Aug. 14.....	L. B. P. Miles.....	.....	.....	.....	0 78	0 29 ^w
Sept. 10.....	do .....	.....	.....	.....	0 27	0 04 ^w
Sept. 12.....	do .....	.....	.....	.....	0 25	0 03 ^w
Sept. 16.....	do .....	.....	.....	.....	0 21	0 04 ^w
Nov. 18.....	do .....	.....	.....	.....	0 58	0 20 ^{wi}

^w Discharge determined by using a 24-inch weir.

ⁱ Stream frozen over.

DAILY GAUGE HEIGHT AND DISCHARGE of Bigbreed creek near Buzzard's ranch, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1			7 68	309		15. 0e		26. 0e
2			6 54	252		14. 0e		25. 0e
3			5 59	205		13. 0e		24. 0e
4			4 60	155		12. 0e		24. 0e
5			3 47	99		11. 0e		24. 0e
6			3 04b	80		10. 0e		25. 0e
7			2 91	72d		9. 0e		27. 0e
8			3 27	90e		8. 0e		30. 0e
9			3 92	122e		7. 0e		27. 0e
10			6 80	265e		6. 0e		25. 0e
11			7 21	285e		5. 0e		24. 0e
12			8 19	335e		4. 0e		20. 0e
13			7 20	285e		4. 0e		16. 0e
14			6 10	230e		4. 0e		12. 0e
15			5 99	225e		4. 0e		8. 0e
16				195e		3. 9e		4. 0e
17			2 68	65d		3. 8e		2. 8e
18				57e		3. 7e		2. 4e
19				47e		3. 7e		2. 3e
20				37e	1. 17	3. 7d	1. 04	2. 3d
21			1 81	27d	1. 16	5. 0		
22		b	10	23	1. 15	5. 0		
23			30	23e	1. 13	5. 0		
24			45	22e	1. 13	5. 0		
25			50	21e	4. 20	136. 0e		
26	6. 30	100		20e	3. 00	77. 0		
27	8. 16	250		20e	2. 15	41. 0		
28	8. 76	363		20e	1. 80	27. 0		
29	8. 36	343		20e	1. 56	18. 2d		
30	8. 09	330		20e	1. 80	27. 0		
31	7. 61	305				27. 0e		

b-b Ice conditions; discharge estimated.

d Actual measurements.

e Discharge estimated.

MONTHLY DISCHARGE of Bigbreed creek near Buzzard's ranch, for 1916

MONTH	DISCHARGE IN SECOND-FeET			RUN-OFF Total in Acre-feet
	Maximum	Minimum	Mean	
March (22-31)	363	10. 0	183. 0	3,621
April	335	20. 0	121. 0	7,200
May	136	4. 0	16. 7	1,027
June (1-20)	30	2. 3	17. 5	696
The period				12,544

SESSIONAL PAPER No. 25a

LITTLEBREED CREEK NEAR BUZZARD'S RANCH

Location.—On the NW. $\frac{1}{4}$ Sec. 11, Tp. 2, Rge. 11, W. 3rd Mer., near Coriander post office.

Records available.—March 28, 1914, to October 31, 1915. Discharge measurements and estimated flow during spring run-off in 1916.

Gauge.—Vertical staff; zero elevation has been maintained at 92.82 feet since establishment.

Bench-mark.—Permanent iron bench-mark located on the left bank about sixty feet from the gauge; assumed elevation 100.00 feet.

Channel.—Probably permanent.

Discharge measurements.—Made by current-meter and by weir at low stages.

Winter flow.—This station is not maintained during the winter.

Artificial control.—Mr. Buzzard has a dam about one mile below this station but the flow at the gauge is not affected by this structure.

Observer.—None available during 1916.

DISCHARGE MEASUREMENTS of Littlebreed creek near Buzzard's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 24.....	J. E. Caughey.....	17.0	109.00	0.88	5.28	96.00
Mar. 25.....	do	165.0	74.75	0.84	4.68	63.00
Mar. 27.....	do	400.0	225.00	1.62	4.78	364.00
Mar. 28.....	do	420.0	314.65	2.01	6.38	695.00
Mar. 29.....	do	600.0	290.00	1.42	6.44	482.00
Mar. 30.....	do	580.0	256.00	1.42	6.20	433.00
Mar. 31.....	do	530.0	253.50	1.35	6.07	394.00
April 1.....	do	90.5	139.37	1.32	5.81	244.00
April 3.....	do	44.0	28.50	1.79	4.84	115.00
April 4.....	do	14.5	8.47	2.04	4.57	79.00
April 11.....	do	93.0	95.70	2.34	5.50	292.00
April 14.....	do	49.5	39.00	2.49	5.13	177.00
April 21.....	do	18.0	31.40	0.41	2.13	13.00
May 20.....	do	4.4	3.00	0.50	0.90	1.49
May 29.....	do	12.0	10.70	0.64	1.75	6.90
June 20.....	do				0.70	0.33 ^w
Aug. 13.....	L. B. P. Miles.....				Dry	Nil
Sept. 12.....	do				"	"
Nov. 18.....	do				"	"

^w Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Littlebreed creek near Buzzard's ranch, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			5.80	244.0d		10.00e		5.00e
2.....			5.45	174.0e		10.00e		5.00e
3.....			4.83	115.0d		10.00e		4.80e
4.....			4.57	79.0d		9.60e		4.70e
5.....			4.34	62.0e		9.40e		5.00e
6.....			3.84	47.0e		9.20e		7.00e
7.....			3.42	47.0e		9.00e		8.00e
8.....			3.74	47.0e		8.40e		8.00e
9.....			4.04	59.0e		8.00e		7.00e
10.....			4.93	231.0e		7.50e		6.00e
11.....			5.43	292.0d		7.00e		5.00e
12.....			6.46	292.0e		6.00e		4.00e
13.....			5.53	239.0e		5.00e		3.00e
14.....			5.13	177.0d		4.50e		2.00e
15.....			4.93	130.0e		4.00e		1.00e
16.....				60.0e		3.00e		0.80e
17.....			3.50	46.0e		2.00e		0.60e
18.....				46.0e		1.60e		0.40e
19.....				60.0e		1.50e		0.35e
20.....				30.0e	0.90	1.49d	0.70	0.33d
21.....			2.13	13.0d	0.87	1.27		
22.....		5.0e		13.0e	0.81	0.84		
23.....		15.0e		12.0e	0.80	0.83		
24.....	5.28	96.0e		12.0e	0.80	0.83		
25.....	4.68	63.0d		12.0e	5.40	220.00		
26.....	4.64	275.0e		12.0e	4.40	81.00		
27.....	4.77	364.0d		11.0e	3.30	36.00		
28.....	6.37	695.0d		11.0e	2.20	14.00		
29.....	6.44	482.0d		11.0e	1.75	6.90		
30.....	6.19	433.0d		10.0e	1.70	6.00		
31.....	6.06	394.0d				5.40e		

d Actual measurement.

e Discharge estimated.

MONTHLY DISCHARGE of Littlebreed creek near Buzzard's ranch, for 1916

(Drainage area 61 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (22-31).....	695.0	5.00	282.0	4.620	1.72	5,592
April.....	292.0	10.00	86.0	1.410	1.57	5,117
May.....	220.0	0.83	16.1	0.264	0.30	990
June (1-20).....	8.0	0.33	3.9	0.064	0.05	155
The period.....					3.64	11,854

SESSIONAL PAPER No. 25b

FRENCHMAN RIVER AT MARTIN'S RANCH

Location.—On the NW. $\frac{1}{4}$ Sec. 24, Tp. 1, Rge. 11, W. 3rd Mer., about five miles below station at Buzzard's ranch.

Records available.—Two discharge measurements only in 1915, but complete records from March 14 to October 31, 1916.

Gauge.—Vertical staff on right bank just above trail crossing; zero elevation maintained at 91.42 feet.

Bench-mark.—Temporary. Top of wooden peg at fence, 40 feet east of gauge; assumed elevation 100.00 feet.

Discharge measurements.—Made by wading at crossing below gauge or from cable at Buzzard's ranch.

Remarks.—This station was established on September 22, 1915, to take the place of the station at Buzzard's ranch, as an observer could not be obtained at that point.

During the spring break-up in 1916, the engineer made discharge measurements and observations at Buzzard's ranch because there is no cable at this station. The flow at this station was determined by adding the flow of Littlebreed creek and an allowance for local run-off to the flow at Buzzard's ranch.

DISCHARGE MEASUREMENTS of Frenchman river at Martin's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 19.....	J. E. Caughey.....	41.0	97.85	2.42	3.92b	237
Mar. 21.....	do.....	77.0	528.00	1.91	9.63	1,007x
Mar. 22.....	do.....	97.0	666.50	2.39	11.40	1,592x
Mar. 24.....	do.....	98.0	689.70	1.88	11.44	1,300x
Mar. 25.....	do.....	103.0	771.25	1.69	12.21	1,308x
Mar. 27.....	do.....	102.0	745.55	1.84	11.93	1,360x
April 4.....	do.....	220.0	1,181.75	2.06	13.98	2,436x
April 5.....	do.....	115.0	841.75	2.01	12.68	1,694x
April 7.....	do.....	68.0	309.90	2.58	6.34	799x
April 11.....	do.....	117.0	813.82	1.95	12.46	1,596x
April 12.....	do.....	120.0	917.15	2.10	13.35	1,928x
April 13.....	do.....	117.0	862.35	2.04	12.94	1,750x
April 14.....	do.....	107.0	733.70	1.94	11.51	1,426x
April 17.....	do.....	68.0	357.55	2.29	7.21	818x
April 21.....	do.....	52.0	127.50	2.82	3.01	359x
May 22.....	do.....	38.5	60.80	1.64	1.61	100
June 20.....	do.....	41.0	91.95	2.08	2.32	191
Aug. 13.....	L. B. P. Miles.....	40.0	58.80	1.48	1.50	87
Sept. 12.....	do.....	46.0	31.45	1.34	1.13	42
Sept. 15.....	do.....	45.5	33.17	1.17	1.15	39
Nov. 25.....	do.....	45.0	35.10	1.19	1.30b	42
Nov. 27.....	do.....	43.2	24.72	1.60	0.74b	40x

b Ice conditions.

x Discharge measured and gauge height observed at old gauging station at Buzzard's ranch on NW. $\frac{1}{4}$ Sec. 3, Tp. 2, Rge. 11, W. 3rd Mer., and does not include the flow of Littlebreed creek or local run-off.

DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman river at Martin's ranch, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1				4.424	2.19	171	4.51	592
2				3.754	2.15	165	4.52	594
3				3.495	2.15	165	4.38	566
4				2.515	2.29	186	3.98	486
5				1.756	2.29	186	3.53	399
6				1.051	2.13	162	3.12	323
7				846	2.02	147	2.84	273
8				703	1.97	140	2.62	237
9				800	1.95	137	2.40	202
10			8.51	1,392	1.97	140	2.64	240
11			11.43	1,976	1.94	136	3.18	333
12			12.98	2,286	1.90	136	4.48	586
13			13.80	2,450	1.90	136	3.21	339
14	3.80b	100	12.26	2,142	2.04	150	2.58	231
15	5.42	200	11.34	1,958	1.90	130	2.38	199
16	4.82	300	10.64	1,818	1.85	123	2.62	237
17	3.98	300	8.07	1,304	1.81	117	3.72	435
18	3.82	250	6.26	942	1.79	115	3.62	416
19	3.92	237	5.50	790	1.72	106	2.88	280
20		700	5.10	710	1.72	106	2.38	199
21		1,007	4.50	590	1.67	100	2.12	161
22		1,597	3.61	414	1.34	64	2.05	151
23		1,485	3.37	369	1.59	91	2.45	210
24		1,396	3.22	341	1.58	90	2.10	158
25		1,371	2.93	288	3.12	323	2.10	158
26		1,625	2.73	255	4.44	578	1.92	133
27		1,733	2.63	239	4.66	622	1.82	119
28		3,845	2.48	215	4.68	646	1.95	137
29		4,172	2.40	202	3.68	427	3.24	344
30		5,223	2.33	192	3.38	370	5.52	794
31		4,734			3.80	450		

b-b Ice conditions; discharge estimated from observations and measurements made by engineer in field at the time.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Frenchman river at Martin's ranch, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	4.82	654	2.05	151	1.14	45	1.08	40
2.....	4.51	592	2.90	283	1.10	42	1.09	41
3.....	4.34	558	2.65	242	1.10	42	1.12	44
4.....	7.00	1,090	2.30	187	1.10	42	1.15	46
5.....		1,190e	2.14	164	1.14	45	1.18	48
6.....		1,390e	1.89	129	1.13	44	1.30	60
7.....		1,270e	1.73	108	1.12	44	1.44	74
8.....	5.76	842	1.62	94	1.11	43	1.40	70
9.....		1,130e	1.52	82	1.22	52	1.36	66
10.....		1,290e	1.46	76	1.26	56	1.37	67
11.....		1,170e	1.52	82	1.20	50	1.34	64
12.....	5.41	772	1.48	78	1.14	45	1.34	64
13.....	2.91	285	1.51	81	1.15	46	1.33	63
14.....	2.34	193	1.44	74	1.14	45	1.34	64
15.....	2.31	188	1.37	67	1.14	45	1.44	74
16.....	1.97	140	1.34	64	1.14	45	1.46	76
17.....	1.86	124	1.32	62	1.14	45	1.46	76
18.....	2.41	204	1.36	66	1.13	44	1.48	78
19.....	2.86	276	1.35	65	1.12	44	1.50	80
20.....	2.59	232	1.32	62	1.10	42	1.54	85
21.....	2.76	260	1.28	58	1.09	41	1.54	85
22.....	2.35	194	1.25	55	1.08	40	1.53	84
23.....	1.88	127	1.24	54	1.06	39	1.48	78
24.....	1.73	108	1.20	50	1.06	39	1.42	72
25.....	1.62	94	1.18	48	1.06	39	1.37	67
26.....	1.57	88	1.18	48	1.08	40	1.39	69
27.....	1.92	133	1.20	50	1.07	40	1.34	64
28.....	1.64	97	1.14	45	1.08	40	1.35	65
29.....	2.66	244	1.16	47	1.08	40	1.35	65
30.....	5.24	738	1.15	46	1.09	41	1.34	64
31.....	2.40	202	1.14	45			1.34	64

e Discharge estimated.

MONTHLY DISCHARGE of Frenchman river at Martin's ranch, for 1916

(Drainage area 1,939 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (14-31).....	5,223	100	1,682	0.867	0.58	60,035
April.....	4,424	192	1,341	0.692	0.77	79,799
May.....	646	64	213	0.110	0.13	13,097
June.....	794	119	318	0.164	0.18	18,922
July.....	1,390	88	512	0.264	0.30	31,482
August.....	283	45	89	0.046	0.05	5,472
September.....	56	39	44	0.023	0.03	2,618
October.....	85	40	66	0.034	0.04	4,058
The period.....					2.08	215,483

MCEACHRAN CREEK AT MCCOY'S RANCH

Location.—On the SW. $\frac{1}{4}$ Sec. 6, Tp. 1, Rge. 7, W. 3rd Mer., about fifty feet north of Mr. McCoy's house.

Records available.—May 1, 1914 to August 31, 1916.

Gauge.—Vertical staff; zero elevation has been maintained at 89.50 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Probably permanent.

Discharge measurements.—Made by wading with current-meter and by weir at low stages.

Winter flow.—Station not maintained during the winter.

Diversion.—There are no diversions from this stream.

Observer.—Alfred McCoy.

DISCHARGE MEASUREMENTS of McEachran creek at McCoy's ranch, for 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 20.....	J. E. Caughey.....	8.0	19.10	2.75	1.85	52.00
May 25.....	do.....	33.0	40.30	1.74	2.20	70.00
May 26.....	do.....	68.0	90.80	2.92	3.00	265.00
June 23.....	do.....	3.0	1.07	1.36	0.78	1.45
Aug. 12.....	L. B. P. Miles.....				0.30	0.04 ^w
Sept. 13.....	do.....				0.19	Nil
Nov. 20.....	do.....				Dry	"
Nov. 23.....	do.....					"

^w Discharge determined by using a 24-inch weir.

DAILY GAUGE HEIGHT AND DISCHARGE of McEachran creek at McCoy's ranch, for 1916

DAY	March		April		May		June		July		August	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			5.94	800.0be	1.35	16.00	1.46	21.0	1.25	12.50	0.63	0.65
2.....			4.74	956.0	1.34	15.60	1.40	18.0	1.25	12.50	0.64	0.70
3.....			4.04	676.0	1.32	14.80	1.27	13.1	1.22	11.60	0.63	0.65
4.....			3.29	376.0	1.30	14.00	1.20	11.0	1.18	10.40	0.61	0.55
5.....			2.56	140.0	1.28	13.40	1.10	8.0	1.10	8.00	0.59	0.47
6.....			2.52	131.0	1.25	12.50	1.05	6.5	1.00	5.00	0.52	0.26
7.....			2.69	170.0	1.21	11.30	1.02	5.6	1.00	5.00	0.52	0.26
8.....			2.59	147.0	1.19	10.70	1.00	5.0	1.00	5.00	0.47	0.14
9.....			3.04	280.0	1.18	10.40	0.90	3.0	1.80	42.00	0.43	0.06
10.....			4.26	764.0	1.16	9.80	0.90	3.0	2.05	63.00	0.36	Nil
11.....			4.56	884.0	1.14	9.20	0.90	3.0	2.00	58.00	0.30	"
12.....			5.09	1,096.0	1.12	8.60	0.85	2.5	1.90	50.00	0.34	"
13.....			3.79	576.0	1.05	6.50	0.85	2.5	1.78	41.00	0.35	"
14.....			3.32	388.0	0.95	4.00	0.85	2.5	1.75	38.00	0.35	"
15.....			2.64	158.0	0.85	2.50	0.85	2.5	1.68	34.00	0.34	"
16.....			2.44	116.0	0.80	2.00	0.85	2.5	1.62	29.00	0.34	"
17.....			2.14	73.0	0.80	2.00	.....	2.5e	1.52	24.00	0.34	"
18.....			2.09	67.0	0.80	2.00	0.85	2.5	1.35	16.00	0.34	"
19.....			2.22	83.0	0.80	2.00	0.84	2.4	1.05	6.50	0.32	"
20.....			1.90	50.0	0.80	2.00	0.83	2.3	0.88	2.80	0.32	"
21.....			1.76	39.0	0.87	2.70	0.83	2.3	0.85	2.50	0.31	"
22.....			1.64	31.0	0.76	1.60	0.82	2.2	0.78	1.80	0.30	"
23.....			1.64	31.0	0.72	1.20	0.80	2.0	0.70	1.00	0.28	"
24.....			1.56	26.0	0.70	1.00	0.82	2.2	0.70	1.00	0.28	"
25.....			1.48	22.0	2.10	68.00	1.07	7.1	0.65	0.75	0.27	"
26.....			1.42	19.0	2.92	237.00	1.28	13.4	0.65	0.75	0.27	"
27.....			1.34	15.6	2.13	72.00	1.15	9.5	0.64	0.70	0.26	"
28.....	5.00	100be	1.33	15.2	1.68	34.00	1.03	6.5	0.64	0.70	0.25	"
29.....	5.50	200e	1.34	15.6	1.55	26.00	1.30	14.0	0.62	0.60	0.24	"
30.....	5.70	400e	1.35	16.0	1.65	32.00	1.32	14.8	0.62	0.60	0.24	"
31.....	5.70	700e	.....	.....	1.53	24.00	.....	.....	0.62	0.60	Dry	Dry

b-b Ice conditions.

e Discharge estimated.

SESSIONAL PAPER No. 25B

MONTHLY DISCHARGE of McEachran creek at McCoy's ranch, for 1916

(Drainage area 107 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (28-31).....	700.00	100.00	350.00	3.270	0.486	2,776.0
April.....	956.00	15.20	272.00	2.540	2.830	16,185.0
May.....	237.00	1.00	22.00	0.206	0.238	1,353.0
June.....	21.00	2.00	6.40	0.060	0.067	381.0
July.....	63.00	0.60	15.70	0.147	0.170	965.0
August.....	0.70	Nil	0.12	0.001	0.001	7.0
The period.....					3.792	21,667.0

Creek dry after August 30.

EAST BRANCH MCEACHRAN CREEK AT MCCOY'S RANCH

Location.—On the NE. $\frac{1}{4}$ Sec. 6, Tp. 1, Rge. 7, W. 3rd Mer., at McCoy's ranch, one mile above junction with main stream.

Records available.—Station established May 26, 1916; daily gauge heights and two discharge measurements only in 1916.

Gauge.—Vertical metallic staff fastened to a post and firmly braced to right bank 100 feet above a ford; zero elevation of the gauge maintained at 86.68 feet since establishment.

Bench-mark.—Wooden plug, twenty feet south and fifty feet west of the gauge; assumed elevation 100.00 feet.

Channel.—Slightly shifting and liable to growth of vegetation.

Discharge measurements.—Made by wading with current-meter at ordinary stages; by weir at low stages; cannot be gauged in flood stages.

Observer.—Alfred McCoy.

Remarks.—Creek went dry early in August. Only two discharge measurements prior to this date, therefore unable to plot curve and compute daily discharge.

DISCHARGE MEASUREMENTS of East branch of McEachran creek at McCoy's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 25.....	J. E. Caughey.....	41.0	51.2	2.70	.....^x	138.00
May 26.....	do.....	31.0	47.6	1.32	4.14	63.00
June 24.....	do.....	7.0	3.7	0.36	2.59	1.32
Aug. 11.....	L. B. P. Miles.....					Nil
Sept. 14.....	do.....					"
Nov. 23.....	do.....					"

^x Station established May 26.

DAILY GAUGE HEIGHT, in feet, of East branch of McEachran creek at McCoy's ranch, for 1916

DAY	May	June	July	August
1.....		2.63	3.02	2.06
2.....		2.60	3.02	2.06
3.....		2.58	3.00	2.06
4.....		2.58	3.00	2.05
5.....		2.50	2.09	2.05
6.....		2.57	2.09	2.05
7.....		2.45	2.07	2.05
8.....		2.42	2.07	2.45
9.....		2.40	2.06	2.45
10.....		2.40	2.06	2.40
11.....		2.40	2.05	Dry
12.....		2.42	2.05	"
13.....		2.43	2.04	"
14.....		2.45	2.03	"
15.....		2.45	2.02	"
16.....		2.44	2.02	"
17.....		2.44	2.02	"
18.....		2.42	2.02	"
19.....		2.40	2.01	"
20.....		2.40	2.01	"
21.....		2.40	2.00	"
22.....		2.45	2.00	"
23.....		2.45	2.00	"
24.....		2.40	2.02	"
25.....		2.40	2.02	"
26.....	4.14	2.40	2.03	"
27.....	3.00	2.40	2.03	"
28.....	2.40	2.45	2.03	"
29.....	2.25	2.48	2.05	"
30.....	2.60	3.01	2.05	"
31.....	2.70		2.06	"

HORSE CREEK NEAR BARNARD, MONTANA, U.S.A.

Location.—About one mile north of Barnard post office on United States unsurveyed land, and about one-quarter mile south of the international boundary.

Records available.—May 1, 1914, to October 31, 1916.

Gauge.—Staff gauge, fastened to a post on the right bank. The elevation of the zero of the gauge has been maintained at 92.54 feet since establishment.

Bench-mark.—Wooden stake driven in the left bank 30 feet from the gauge; assumed elevation 100.00 feet.

Channel.—Probably permanent.

Discharge measurements.—Made by wading with current-meter and by weir at low stages.

Winter flow.—This station is not maintained during the winter.

Observer.—W. J. Harris.

DISCHARGE MEASUREMENTS of Horse creek near Barnard, Montana, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 19.....	J. E. Caughey.....	18.5	21.25	1.86	2.43	40.00
May 24.....	do.....	5.5	1.45	1.17	0.53	1.70
June 24.....	do.....	2.5	0.67	1.72	0.54	1.15
Aug. 12.....	L. B. P. Miles.....				0.38	0.10 _w
Sept. 14.....	do.....				0.28	0.03 _w
Nov. 20.....	do.....				0.33	0.07 _{wi}
Nov. 22.....	do.....				0.68 _x	0.06 _{wi}

_w Discharge determined by using a 24-inch weir.

_i Stream frozen over.

_x Staff gauge located at new section 65 feet up stream.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Horse creek near Barnard, Montana, for 1916

DAY	March		April		May		June	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....				200.0e	0.94	5.30	0.87	4.50
2.....				200.0e	0.87	4.50	0.84	4.20
3.....				250.0e	0.85	4.30	0.79	3.70
4.....				260.0e	0.76	3.40	0.75	3.30
5.....				240.0e	0.70	2.80	0.72	3.00
6.....				290.0e	0.65	2.40	0.69	2.70
7.....				320.0e	0.63	2.20	0.65	2.40
8.....				340.0e	0.63	2.20	0.64	2.30
9.....				360.0e	0.62	2.20	0.63	2.20
10.....				364.0e	0.61	2.10	0.62	2.20
11.....				340.0e	0.60	2.00	0.60	2.00
12.....				304.0e	0.59	1.92	0.58	1.84
13.....				184.0e	0.58	1.84	0.56	1.68
14.....				160.0e	0.57	1.76	0.54	1.52
15.....				124.0e	0.57	1.76	0.52	1.36
16.....				124.0e	0.57	1.76	0.50	1.20
17.....				88.0e	0.56	1.68	0.50	1.20
18.....				66.0e	0.55	1.60	0.50	1.20
19.....			2.43f	40.0	0.56	1.68	0.49	1.14
20.....			2.34	37.0	0.54	1.52	0.44	0.84
21.....			2.25	34.0	0.54	1.52	0.49	1.14
22.....			2.01	26.0	0.52	1.36	0.50	1.20
23.....			1.95	25.0	0.52	1.36	0.54	1.52
24.....			1.91	23.0	0.53	1.70d	0.54	1.52
25.....			1.86	22.0		2.00e	0.53	1.44
26.....	10.0e		1.80	21.0	3.50	94.00	0.53	1.44
27.....	20.0e		1.60	16.2	3.00	66.00	0.52	1.36
28.....	50.0e		1.30	10.5	1.40	12.30	0.55	1.60
29.....	120.0e		1.19	8.8	1.09	7.40	0.70	2.80
30.....	140.0e	f	1.00	6.1	0.95	5.40	1.42	12.70
31.....	160.0e				0.90	4.80		

e Discharge estimated; based on field inspection.

f-f Gauge washed out.

d Actual measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Horse creek near Barnard, Montana, for 1916—
Concluded.

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	1.90	23.00	0.46	0.96	0.24	0.04	0.25	0.05
2	1.40	12.30	0.41	0.66	0.25	0.05	0.25	0.05
3	1.00	6.10	0.41	0.66	0.25	0.05	0.25	0.05
4	0.90	4.80	0.40	0.60	0.25	0.05	0.26	0.06
5	0.69	2.70	0.40	0.60	0.25	0.05	0.26	0.06
6	0.60	2.00	0.39	0.55	0.25	0.05	0.27	0.07
7	0.51	1.28	0.39	0.55	0.26	0.06	0.26	0.06
8	0.45	0.90	0.38	0.50	0.26	0.06	0.26	0.06
9	0.40	0.60	0.38	0.50	0.27	0.07	0.25	0.05
10	0.39	0.55	0.37	0.45	0.30	0.10	0.25	0.05
11	0.39	0.55	0.37	0.45	0.32	0.20	0.25	0.05
12	0.50	1.20	0.38	0.50	0.33	0.25	0.24	0.04
13	0.55	1.60	0.37	0.45	0.33	0.16e	0.25	0.05
14	0.52	1.36	0.36	0.40	0.28	0.08	0.25	0.05
15	0.50	1.20	0.35	0.35	0.30	0.10	0.26	0.06
16	0.47	1.02	0.35	0.35	0.29	0.09	0.25	0.05
17	0.45	0.90	0.36	0.40	0.28	0.08	0.25	0.05
18	0.43	0.78	0.35	0.35	0.27	0.07	0.26	0.06
19	0.42	0.72	0.34	0.30	0.26	0.06	0.26	0.06
20	0.41	0.66	0.33	0.25	0.25	0.05	0.27	0.07
21	0.41	0.66	0.32	0.20	0.25	0.05	0.26	0.06
22	0.41	0.66	0.31	0.15	0.25	0.05	0.27	0.07
23	0.40	0.60	0.30	0.10	0.25	0.05	0.27	0.07
24	0.40	0.60	0.29	0.09	0.25	0.05	0.28	0.08
25	0.39	0.55	0.28	0.08	0.24	0.04	0.28	0.08
26	0.39	0.55	0.27	0.07	0.24	0.04	0.29	0.09
27	0.38	0.50	0.26	0.06	0.24	0.04	0.29	0.09
28	0.38	0.50	0.25	0.05	0.25	0.05	0.30	0.10
29	0.50	1.20	0.25	0.05	0.24	0.04	0.29	0.09
30	0.53	1.44	0.24	0.04	0.25	0.05	0.30	0.10
31	0.50	1.20	0.24	0.04	0.25	0.05	0.30	0.10

e Discharge estimated.

MONTHLY DISCHARGE of Horse creek near Barnard, Montana, for 1916

(Drainage area 71 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (26-31)	160.00	10.00	83.00	1.170	0.26	988
April	364.00	6.10	149.00	2.100	2.34	8,866
May	94.00	1.36	8.00	0.133	0.13	492
June	12.70	0.84	2.40	0.034	0.04	143
July	23.00	0.50	2.30	0.032	0.04	141
August	0.96	0.04	0.35	0.005	0.01	22
September	0.25	0.04	0.07	0.001	0.00	4
October	0.10	0.04	0.06	0.001	0.00	4
The period					2.82	10,660

SESSIONAL PAPER No. 25B

BOWREY DITCH FROM ROCK CREEK, MONTANA, U.S.A.

Location.—In United States unsurveyed territory near Barnard, Montana.

Records available.—June 1 to August 26, 1914. No records obtainable in 1915 and 1916.

Gauge.—Vertical staff; elevation of zero 96.51 feet.

Bench-mark.—Stake on left bank; assumed elevation 100.00 feet.

Discharge measurements.—By wading.

Observer.—C. W. Bowrey.

Remarks.—Station visited by J. E. Caughey on June 24, 1916, and there was no flow.

ROCK CREEK NEAR BARNARD, MONTANA, U.S.A.

Location.—On SE. $\frac{1}{4}$ Sec. 10-37N-E.P.M., Montana, U.S.A., about one and one-half mile south of the international boundary.

Records available.—May 1, 1914, to October 31, 1916.

Gauge.—Vertical staff on the right bank of the creek at S. H. Barnard's ranch. For the elevation of the zero of the gauge at former locations see the 1915 report. Gauge was established at present location May 24, 1916; elevation of zero of gauge maintained at 84.07 feet.

Bench-mark.—Wooden plug forty feet south of gauge; assumed elevation 100.00 feet.

Channel.—Fairly permanent.

Discharge measurements.—Made by wading.

Winter flow.—Station not maintained during the winter.

Observer.—S. H. Barnard.

Note.—Gauge was moved because no observer was available at former locations. Present gauging station is below junction with Horse creek.

DISCHARGE MEASUREMENTS of Rock creek near Barnard, Montana, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 19.....	J. E. Caughey.....	47.0	123.00	2.54	3.65	312.0z
May 24.....	do.....	20.0	16.40	1.12	2.40	18.3g
June 24.....	do.....	23.0	37.60	2.15	3.30	81.0
Aug. 12.....	L. B. P. Miles.....	12.0	7.95	0.38	1.95	3.0
Sept. 14.....	do.....	14.0	9.55	0.51	1.98	4.9
Nov. 21.....	do.....	13.5	7.00	0.49	1.96	3.4i

z Gauging made at old station.

g New gauging station established below junction with Horse creek.

i Stream frozen over.

DAILY GAUGE HEIGHT AND DISCHARGE of Rock creek near Barnard, Montana, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1				1,000		92	2.65	30.0
2				990		84	2.50	23.0
3				980		84	2.47	21.0
4				900		76	2.46	21.0
5				800		76	2.46	21.0
6				600		68	2.46	21.0
7				700		60	2.46	21.0
8				700		52	2.45	20.0
9				700b		52	2.45	20.0
10				802		52	2.43	19.3
11				838		40	2.40	18.0
12				802		40	2.36	16.4
13				694		40	2.36	16.4
14				658		46	2.36	16.4
15				622		46	2.29	13.6
16				442		40	2.28	13.3
17				338		34	2.28	13.3
18				306		30	2.26	12.6
19				352d		22	2.23	11.5
20		50be		192		18	2.19	10.1
21		60		140		14	2.25	12.2
22		100		140		22	2.30	14.0
23		160		120		22e	2.45	20.0
24		160		110	2.40	18z	2.46	21.0
25		300		120	2.85	43	2.47	21.0
26		400		120	4.00	147	2.47	21.0
27		700		130	3.30	81	2.49	22.0
28		700		110	2.86	44	2.39	17.6
29		800		110	2.82	41	4.54	198.0
30		1,000		100	2.78	39	4.80	222.0
31		1,000			2.70	34		

d Actual measurement of Horse and Rock creeks.

b-b Ice conditions.

e-e Discharge estimated; no observer, only very meagre data available.

z New Gauging station established below junction with Horse creek.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Rock creek near Barnard, Mountain, for 1916—
Concluded

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	4.49	193.0	2.10	7.30	1.79	0.88	1.93	3.0
2.....	3.10	63.0	2.04	5.50	1.78	0.76	1.93	3.0
3.....	2.90	48.0	1.98	4.00	1.78	0.76	1.94	3.2
4.....	2.85	43.0	1.99	4.20	1.78	0.76	1.95	3.4
5.....	2.57	26.0	1.99	4.20	1.78	0.76	1.96	3.6
6.....	2.50	23.0	1.98	4.00	1.77	0.64	2.00	4.4
7.....	2.40	18.0	1.97	3.80	1.77	0.64	2.03	5.2
8.....	2.35	16.0	1.97	3.80	1.77	0.64	2.05	5.8
9.....	2.30	14.0	1.96	3.60	1.80	1.00	2.05	5.8
10.....	2.29	13.6	1.97	3.80	1.85	1.60	2.05	5.8
11.....	2.39	17.6	1.98	4.00	1.89	2.20	2.05	5.8
12.....	2.30	14.0	1.95	3.40	1.95	3.40	2.05	5.8
13.....	2.25	12.2	1.94	3.20	1.97	3.80	2.05	5.8
14.....	2.22	11.1	1.93	3.00	1.98	4.00	2.01	4.7
15.....	2.15	8.8	1.91	2.60	1.97	3.80	1.98	4.0
16.....	2.12	7.9	1.89	2.20	1.96	3.60	1.95	3.4
17.....	2.10	7.3	1.88	2.10	1.95	3.40	1.95	3.4
18.....	2.08	6.7	1.86	1.76	1.93	3.00	1.95	3.4
19.....	2.07	6.4	1.84	1.48	1.90	2.40	1.95	3.4
20.....	2.07	6.4	1.84	1.48	1.88	2.10	1.96	3.6
21.....	2.06	6.1	1.84	1.48	1.85	1.60	1.96	3.6
22.....	2.06	6.1	1.82	1.24	1.86	1.76	1.97	3.8
23.....	2.06	6.1	1.80	1.00	1.87	1.92	1.98	4.0
24.....	2.01	4.7	1.80	1.00	1.88	2.10	1.97	3.8
45.....	1.96	3.6	1.80	1.00	1.89	2.20	1.97	3.8
26.....	1.97	3.8	1.80	1.00	1.90	2.40	1.96	3.6
27.....	1.98	4.0	1.83	1.36	1.92	2.80	1.96	3.6
28.....	1.99	4.2	1.81	1.12	1.92	2.80	1.97	3.8
29.....	2.00	4.4	1.79	0.88	1.93	3.00	1.97	3.8
30.....	2.14	8.5	1.78	0.76	1.93	3.00	1.97	3.8
31.....	2.23	11.5	1.78	0.76	.....	.....	1.96	3.6

MONTHLY DISCHARGE of Rock creek near Barnard, Montana, for 1916

(Drainage area 298 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (20-31).....	1,000.0	50.00	452.0	1.520	0.68	10,758
April.....	1,000.0	100.00	487.0	1.630	1.82	28,979
May.....	147.0	14.00	50.0	0.168	0.19	3,074
June.....	222.0	10.10	31.0	0.104	0.12	1,845
July.....	1,930.0	3.60	20.0	0.067	.....	1,230
August.....	7.3	0.76	2.6	.....	.....	160
September.....	4.0	0.64	2.1	.....	.....	125
October.....	5.8	3.00	4.1	.....	.....	252
The period.....	.....	.....	.....	.....	2.81	46,423

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Frenchman river drainage basin, in 1916

Date	Engineer	Stream	Location	Width	Area of Section	Mean Velocity	Discharge
				<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
May 10	J. E. Caughey	Blacktail creek. . . .	NW. 20-6-23-3				1.53 _w
June 9	do	do	do				1.02 _w
July 10	do	do	do				0.62 _w
Sept. 1	L. B. P. Miles	do	do				0.33 _w
Oct. 13	do	do	do				0.16 _w
Nov. 3	do	do	do				0.25 _w
Mar. 28	J. E. Caughey	Buzzard's ditch	NW. 11-2-11-3	13.0	18.85	3.29	62.00
Mar. 29	do	do	do	13.5	20.80	3.32	69.00
April 4	do	do	do	27.0	23.65	2.62	62.00
April 6	do	do	do	28.0	20.90	2.25	47.00
April 7	do	do	do	26.0	20.00	2.35	47.00
April 8	do	do	do	28.0	21.90	2.14	47.00
April 13	do	do	do	28.0	35.35	2.51	89.00
April 14	do	do	do	28.0	36.45	2.69	98.00
April 17	do	do	do	27.0	22.50	2.04	46.00
May 9	do	Calf creek.	SE. 5-8-22-3	3.5	3.00	0.57	1.71
June 7	do	do	do	4.0	2.80	0.52	1.46
July 24	L. B. P. Miles	do	do	3.4	2.38	0.45	1.07
Aug. 29	do	do	do				1.13 _w
May 10	J. E. Caughey	Concrete coulee	NW. 2-7-23-3	3.6	1.32	1.89	2.50
June 8	do	do	do	3.2	1.26	1.20	1.52
July 10	do	do	do				1.44
July 25	do	do	do	2.7	0.78	1.36	1.06
Aug. 31	L. B. P. Miles	do	do				0.72 _w
Nov. 3	do	do	do				1.37 _w
May 10	do	Doyle coulee.	SW. 17-7-22-3				0.50 _w
June 8	do	do	do				0.80
July 10	do	do	do				0.27 _w
July 25	do	do	do				0.24 _w
Aug. 31	do	do	do				0.23 _w
Nov. 3	do	do	do				0.43 _w
April 24	J. E. Caughey	E. br. Snake creek . . .	NW. 21-4-12-3	4.0	0.90	0.52	0.47
May 19	do	do	do				Nil
May 31	do	do	do	4.0	1.45	0.76	1.10
June 26	do	do	do				0.04 _w
Aug. 8	L. B. P. Miles	do	do				Nil
Aug. 14	do	do	do				"
Sept. 10	do	do	do				"
Sept. 16	do	do	do				"
Nov. 15	do	do	do				"
May 19	J. E. Caughey	Fireguard creek	SE. 5-3-11-3				"
June 26	do	do	do				0.02 _w
Aug. 9	L. B. P. Miles	do	do				Nil
Aug. 14	do	do	do				"
Sept. 10	do	do	do				"
Sept. 16	do	do	do				"
Nov. 15	do	do	do				"
May 30	J. E. Caughey	Little Pinto creek . . .	SE. 2-4-12-3	11.0	6.10	2.23	13.60
June 26	do	do	do				0.08 _w
Aug. 9	L. B. P. Miles	do	do				"
Aug. 14	do	do	do				"
Sept. 10	do	do	do				"
Sept. 16	do	do	do				"
Nov. 15	do	do	do				"
May 10	J. E. Caughey	Petrified coulee. . . .	SE. 18-7-22-3				0.28 _w
June 8	do	do	do				0.56 _w
July 10	do	do	do				0.38 _w
July 25	do	do	do				0.18 _w
Aug. 31	L. B. P. Miles	do	do				0.21 _w
Nov. 3	do	do	do				0.28 _w
May 30	J. E. Caughey	Police creek	SW. 30-3-11-3	13.0	7.30	0.84	6.10
June 26	do	do	do				0.08 _w
Aug. 9	L. B. P. Miles	do	do				Nil
Aug. 14	do	do	do				"
Sept. 10	do	do	do				"
Sept. 16	do	do	do				"
Nov. 15	do	do	do				"
June 8	J. E. Caughey	Rose creek	NE. 26-7-22-3				0.94 _w
Oct. 27	L. B. P. Miles	do	do				0.94 _w
May 18	J. E. Caughey	Shotgun creek	NW. 21-4-14-3				Nil
June 1	do	do	do	4.0	3.08	0.43	1.34
June 27	do	do	do				0.06 _w
Aug. 7	L. B. P. Miles	do	do				Nil
Aug. 15	do	do	do				"
Sept. 9	do	do	do				"
Sept. 16	do	do	do				"
Nov. 14	do	do	do				"

_w Discharge determined by using a weir.

SWIFTCURRENT CREEK DRAINAGE BASIN

General Description

Swiftcurrent creek rises in the eastern slope of the Cypress hills, follows a northeasterly course for seventy-five miles and then a northerly one for about twenty-five miles and finally empties into the South Saskatchewan river in Township 20, range 13, West of 3rd Meridian.

The only important tributary is Bone creek, which rises in the Cypress hills and joins the Swiftcurrent in Township 10, Range 19, West of 3rd Meridian.

The main stream flows through a valley, two to three hundred feet deep and a mile wide, to within a few miles of its mouth, where it enters sandstone gorge, about five hundred feet deep.

The bench land above the creek is of rolling prairie, broken by innumerable coulees. The soil is a sandy loam. There is very little tree growth along the stream.

The mean annual rainfall at the town of Swift Current is about fifteen inches. This increases slightly at the stream's headwaters. The greatest precipitation occurs during the months of May, June and July. From November to April the stream is frozen over.

There are a number of small irrigation ditches in this drainage basin, and the town of Swift Current and the Canadian Pacific Railway Company take water for domestic and industrial purposes from the creek.

D. H. POLLOCK EAST DITCH FROM SWIFTCURRENT CREEK

Location.—On NW. $\frac{1}{4}$ Sec. 22, Tp. 7, Rge. 21, W. 3rd Mer., about one-quarter mile from point of intake.

Records available.—Irrigation seasons 1913-16, and a few discharge measurements from 1909-12.

Gauge.—Vertical staff; zero maintained at elevation of 3,048.28 feet during 1915-16.

Bench-mark.—Permanent iron on Swiftcurrent creek; elevation 3,042.77 feet above mean sea-level.

Discharge measurements.—Made with meter or weir.

Observer.—D. H. Pollock.

Remarks.—Ditch used from June 6 to 13, and June 17 to July 8. During period of flow discharge varied from 0.50 to 1.00 second-foot, giving a total run-off of about 45 acre-feet for the period.

DISCHARGE MEASUREMENTS of D. H. Pollock's East ditch from Swiftcurrent creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
June 6.....	J. E. Caughey.....	2.80	0.86	1.16	0.58	1.00
July 5.....	do.....	2.80	0.43	0.74	0.60	0.32
July 19.....	do.....					Nil

D. H. POLLOCK WEST DITCH FROM SWIFTCURRENT CREEK

Location.—On NW. $\frac{1}{4}$ Sec. 22, Tp. 7, Rge. 21, W. 3rd Mer.

Records available.—Discharge measurements taken in the irrigation season of 1913. Gauge heights during the irrigation season of 1914. J. E. Caughey visited this station on July 19, 1916, and reported no flow.

Gauge.—Vertical staff on the north side of the west end of the flume; zero elevation 3,072.92 feet, referred to Canadian Pacific Railway datum.

Bench-mark.—Permanent iron bench-mark situated near the flume; elevation 3,074.89 feet. (Canadian Pacific Railway datum.)

Channel.—Flume.

Discharge measurements.—Made with meter or weir.

Observer.—D. H. Pollock.

Remarks.—Very little, if any, use was made of this ditch during 1916.

SWIFTCURRENT CREEK AT POLLOCK'S RANCH

Location.—On the SW. $\frac{1}{4}$ Sec. 22, Tp. 7, Rge. 21, W. 3rd Mer.

Records available.—May 18, 1909, to October 31, 1916. Two discharge measurements in 1908.

Gauge.—Vertical staff; elevation of zero 1909-12 maintained at 89.25 feet; 1913-16 maintained at 3,031.52 feet for the wading section and 3,035.27 feet for the gauge at the weir section.

Bench-mark.—Permanent iron bench-mark; elevation 3,042.77 feet above mean sea-level.

Channel.—Sand and gravel.

Discharge measurements.—At high stages by wading; permanent three-foot weir installed in 1914 for measuring the ordinary flow.

Winter flow.—Station not maintained during the winter.

Observer.—D. H. Pollock.

DISCHARGE MEASUREMENTS of Swiftcurrent creek at Pollock's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 1.....	M. H. French.....	3.5	6.00	1.54	4.20 _c	9.30
April 11.....	do.....	5.0	8.30	1.71	2.59 _c	14.20
May 4.....	J. E. Caughey.....	2.7	1.26	1.67	1.70	2.10
May 15.....	do.....	2.5	0.96	1.90	1.55	1.82
June 9.....	do.....	3.0	1.75	1.77	1.75	3.10
June 14.....	do.....	3.0	1.66	1.51	1.74	2.50
July 7.....	do.....	3.0	1.31	1.07	1.45	1.40
July 20.....	do.....				1.44	1.46 _w
July 22.....	do.....				1.39	1.15 _w
July 31.....	L. B. P. Miles.....				1.42	1.38 _w
Aug. 24.....	do.....				1.32	1.30 _w
Sept. 5.....	do.....				1.38	1.30 _w
Sept. 26.....	do.....				1.44	1.62 _w
Nov. 6.....	do.....				1.48	1.63 _w

w Discharge determined by using a 36-inch weir.

c Gauge heights affected by ice going out.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent creek at Pollock's ranch, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	6.50 ^b		4.20 ^c	9.3 ^d	1.84	3.30	1.90	3.90
2.....	6.30		2.86	9.5 ^e	1.83	3.30	1.85	3.40
3.....	6.27		2.62	9.9 ^e	1.85	3.40	1.79	3.00
4.....	6.27		2.58	10.2 ^e	1.72	2.60	1.68	2.40
5.....	6.28		2.24	11.0 ^e	1.72	2.60	1.90	3.90
6.....	6.28		2.15	11.5 ^e	1.70	2.50	1.45	1.49
7.....	6.27		2.10	11.8 ^e	1.64	2.20	1.45	1.49
8.....	6.30		2.02	12.5 ^e	1.58	2.00	1.46	1.53
9.....	6.51		2.08	13.5 ^e	1.57	1.92	1.45	1.49
10.....	6.50		2.65	14.7 ^e	1.56	1.89	2.00	4.90
11.....	6.30		2.59 ^c	14.2 ^d	1.56	1.89	1.90	3.90
12.....	6.25		2.58	14.1	1.56	1.89	1.65	2.30
13.....	6.20		2.58	14.1	1.55	1.85	1.64	2.20
14.....	5.60		2.62	14.7	1.55	1.85	1.74	2.70
15.....	5.58		2.58	14.1	1.55	1.85	1.73	2.60
16.....	5.55		2.58	14.1	1.75	2.70	1.70	2.50
17.....	5.50		2.53	13.2	1.65	2.30	5.00	55.00
18.....	5.40		2.51	12.9	1.60	2.00	1.45	1.49
19.....	5.25		2.45	11.8	1.57	1.92	1.46	1.53
20.....	5.40		2.43	11.5	1.55	1.85	1.45	1.49
21.....	5.55		2.35	10.1	1.52	1.74	1.46	1.53
22.....	5.40		2.13	6.6	1.52	1.74	1.86	3.40
23.....	4.30		1.94	4.2	1.52	1.74	1.76	2.80
24.....	4.00		1.91	4.0	1.55	1.85	1.47	1.56
25.....	3.90		1.82	3.2	2.00	4.90	1.46	1.53
26.....	3.80		1.82	3.2	1.85	3.40	1.45	1.49
27.....	4.00		1.84	3.3	2.10	6.20	1.49	1.63
28.....	4.40		1.86	3.4	2.27	8.80	1.45	1.49
29.....	4.40		1.87	3.6	2.25	8.40	1.65	2.30
30.....	4.90		1.85	3.4	2.20	7.70	1.46	1.53
31.....	4.60 ^b				2.00	4.90		

^b Ice conditions, March 1 to 31; no discharge measurements made during period.^d Actual measurement.^e Discharge estimated.^{c-e} Gauge heights affected by ice going out.

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent creek at Pollock's ranch, for 1916
—Concluded

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	1.40	1.36	1.42	1.38	1.35	1.38	1.48	1.62
2	1.36	1.26	1.42	1.46	1.36	1.38	1.60	2.20
3	1.97	4.60	1.41	1.54	1.39	1.46	1.75	3.11
4	2.06	5.70	1.40	1.62	1.40	1.46	2.00	3.60
5	1.70	2.50	1.70	3.60	1.40	1.46	1.70	2.60
6	2.16	7.10	1.42	1.79	1.40	1.46	1.60	1.79
7	1.95	4.30	1.40	1.79	1.40	1.46	1.60	1.79
8	1.85	3.40	1.75	2.63	1.39	1.38	1.52	1.62
9	1.76	2.80	1.60	2.20	1.39	1.38	1.53	1.46
10	1.64	2.20	1.55	1.79	1.38	1.30	1.53	1.23
11	1.58	2.00	1.50	1.38	1.38	1.30	1.53	1.23
12	1.58	2.00	1.47	1.23	1.38	1.30	1.53	1.23
13	1.58	2.00	1.44	1.23	1.38	1.30	1.53	1.23
14	1.56	1.89	1.44	1.23	1.39	1.38	1.54	1.30
15	1.52	1.74	1.43	1.15	1.38	1.30	1.56	1.38
16	1.48	1.60	1.43	1.15	1.38	1.30	1.56	1.38
17	1.58	2.00	1.43	1.15	1.38	1.23	1.56	1.46
18	1.48	1.60	1.42	1.23	1.38	1.23	1.57	1.54
19	1.46	1.53	1.42	1.23	1.38	1.23	1.56	1.46
20	1.44	1.46	1.41	1.15	1.38	1.23	1.54	1.30
21	1.43	1.38	1.41	1.15	1.38	1.23	1.52	1.23
22	1.45	1.38	1.41	1.08	1.38	1.23	1.50	1.23
23	1.43	1.38	1.37	1.15	1.39	1.30	1.49	1.15
24	1.43	1.38	1.35	1.15	1.41	1.38	1.48	1.15
25	1.43	1.38	1.34	1.15	1.42	1.38	1.47	1.15
26	1.60	2.20	1.35	1.15	1.44	1.46	1.47	1.15
27	1.60	2.20	1.35	1.15	1.50	1.62	1.47	1.23
28	1.50	1.79	1.35	1.23	1.49	1.62	1.47	1.23
29	1.70	2.63	1.36	1.23	1.46	1.46	1.48	1.23
30	1.55	1.96	1.35	1.23	1.46	1.46	1.49	1.23
31	1.42	1.38	1.35	1.23	.....	.....	1.49	1.30

MONTHLY DISCHARGE of Swiftcurrent creek at Pollock's ranch, for 1916

(Drainage area 16 square miles)

MONTH	DISCHARGE IN SECOND-FeET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April	14.70	3.20	9.80	0.614	0.68	583
May	8.80	1.74	3.10	0.194	0.22	191
June	55.00	1.49	4.10	0.256	0.28	244
July	7.10	1.26	2.30	0.144	0.17	141
August	3.60	1.08	1.45	0.091	0.10	89
September	1.62	1.23	1.37	0.086	0.10	82
October	3.60	1.15	1.54	0.096	0.11	95
The period					1.66	1,425

SESSIONAL PAPER No. 25a

MEAN MONTHLY DISCHARGE in Second-feet of Swiftcurrent creek at Pollock's ranch

MONTH	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		1.38	1.51	1.54	1.47	1.76	1.40	1.54	1.51	93
November.....			1.80 ^b	1.90 ^c						
December.....										
January.....										
February.....										
March.....										
April.....	2.30		19.00 ^c	4.10	3.10	3.60 ^d	9.80		4.80	272
May.....	0.62	1.98 ^a	3.80	1.83	1.58	2.40	3.10		2.20	137
June.....	0.90	1.32	1.62	1.26	0.94	1.90	4.10		1.72	102
July.....	0.57	0.91	0.77	1.00	0.60	1.40	2.30		1.08	66
August.....	0.73	0.90	1.16	1.30	1.24	1.50	1.45		1.18	73
September.....	1.11	1.40	1.34	1.12	1.40	1.40	1.37		1.31	78
Total in acre-ft....	372	469	1,548	735	621	837	1,416			821

^a 4-31.^b 1-6.^c 7-30.^d 2-30.^e 1-15.

Drainage areas 12 square miles 1910.

Drainage areas 16 square miles 1911.

Drainage areas 16 square miles 1913.

Drainage areas 16 square miles 1914.

AXTON DITCH FROM SWIFTCURRENT CREEK

Location.—On NE. $\frac{1}{4}$ Sec. 26, Tp. 7, Rge. 21, W. 3rd Mer., near South Fork post office.*Records available.*—Gauge heights for the period June 10 to July 9, 1914.*Gauge.*—Vertical staff; zero elevation 3,014.01 feet.*Bench-mark.*—Iron bench-mark; elevation 3,015.96 feet.*Observer.*—J. W. E. Axton.*Remarks.*—With the exception of some natural flooding in the spring, no water was diverted on to the land during 1915 and 1916.

JONES CREEK AT STEARNS' RANCH

Location.—On SE. $\frac{1}{4}$ Sec. 20, Tp. 8, Rge. 20, W. 3rd Mer.*Records available.*—May 15, 1912, to September 12, 1915. Discharge measurements only in 1916.*Gauge.*—Vertical staff; zero maintained at elevation of 93.14 since establishment.*Bench-mark.*—Permanent iron bench-mark; assumed elevation 100.00 feet.*Channel.*—Composed of clay and sand.*Discharge measurements.*—Made by wading with current-meter or with a weir.*Winter flow.*—Station not maintained during winter.*Observer.*—No observer available in 1916.

DISCHARGE MEASUREMENTS of Jones creek at Stearns' ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 11.....	M. H. French.....	9.0	12.20	1.20	2.81	14.70
May 4.....	J. E. Caughey.....	5.7	7.80	0.92	1.75	7.20
June 6.....	do.....	7.5	12.10	0.95		11.50
June 15.....	do.....	5.4	5.49	1.11	1.35	6.10
July 5.....	do.....	5.2	3.09	1.41	0.96	4.40
Aug. 24.....	L. B. P. Miles.....				0.58	0.67 ^w
Sept. 6.....	do.....					0.81 ^w

^w Discharge measurement made by using a 24-inch weir.

STEARNS BROS. SOUTH DITCH NEAR LEITCHVILLE

Location.—On SW. $\frac{1}{4}$ Sec. 9, Tp. 9, Rge. 20, W. 3rd Mer.

Gauge.—Vertical staff just above weir. Elevation of zero of gauge maintained at 110.83 feet since establishment. Elevation of crest of weir maintained at 111.39 ft. since establishment.

Bench-mark.—One bench-mark used for both north and south ditches; seven-eighths inch iron pin located four feet to the right and two feet above the weir in the north ditch; assumed elevation 100.00 feet.

Channel.—One; heavy loam bed

Discharge measurements.—Made by a weir.

Observers.—Stearns Bros.

Remarks.—This station was established on July 21, 1915. No records were obtained in 1915 or 1916, and it is believed that very little, if any, water was diverted during 1916.

STEARNS BROS. NORTH DITCH NEAR LEITCHVILLE

Location.—On NW. $\frac{1}{4}$ Sec. 9, Tp. 9, Rge. 20, W. 3rd Mer.

Gauge.—Vertical staff just above weir; elevation of zero maintained at 98.67 feet since establishment; elevation of crest of weir maintained at 99.14 feet since establishment.

Bench-mark.—Seven-eighths-inch iron pin, located four feet to the right and two feet above the weir; assumed elevation 100.00 feet.

Channel.—One, heavy loam bed.

Discharge measurements.—Made by a weir.

Observers.—Stearns Bros.

Remarks.—This station was established July 21, 1915. No records were obtained in 1915 or 1916. It is believed that very little, if any, water was diverted during 1916.

STEARNS DITCH NEAR DOLLARD

Location.—On the SW. $\frac{1}{4}$ Sec. 20, Tp. 8, Rge. 20, W. 3rd Mer., 600 feet from headgate of ditch.

Records available.—Discharge measurements only in 1914.

Gauge.—Vertical staff, graduated to feet and inches; elevation 97.46 feet.

Bench-mark.—Top of stake, marking initial point for soundings; assumed elevation 100.00 feet.

Discharge measurements.—Made with weir.

Observer.—C. E. Stearns.

Remarks.—This station was visited on July 5, 1916, but there was no flow. It is understood that very little water was diverted during 1915 and 1916.

SINCLAIR SOUTH DITCH NEAR GULL LAKE

Location.—On SE. $\frac{1}{4}$ Sec. 18, Tp. 10, Rge. 19, W. 3rd Mer.

Gauge.—Vertical staff, situated on the right side of the ditch and 300 feet below the headgate; zero elevation maintained at 97.72 feet since establishment; elevation of crest of weir maintained at 98.32 feet since establishment.

Bench-mark.—Permanent iron bench-mark, four feet to the right and two feet above the weir; assumed elevation 100.00 feet.

Channel.—One channel at all stages, clay loam bed.

Discharge measurements.—Made by a weir.

Observer.—K. Sinclair.

Remarks.—This station was established on July 22, 1915. No records were obtained in 1915 or 1916. It is understood that some water was used in 1915, but very little, if any, was diverted during 1916.

SWIFTCURRENT CREEK (UPPER STATION) AT SINCLAIR'S RANCH

Location.—On the NE. $\frac{1}{4}$ Sec. 18, Tp. 10, Rge. 19, W. 3rd Mer., above the mouth of Bone creek.

Records available.—Open water flow, June 15, 1910, to October 31, 1916.

Gauge.—Vertical staff; zero was maintained at 87.91 feet during 1910-11 and 87.86 feet during 1912-16.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Permanent.

Discharge measurements.—Made with meter, and by weir at low stages.

SESSIONAL PAPER No. 25b

Winter flow.—This station is not maintained during the winter.

Diversions.—Messrs. D. H. Pollock and J. W. E. Axton divert water for irrigation purposes above this station.

Observer.—Mrs. K. Sinclair.

Remarks.—Records at this station are affected by backwater from Bone creek at certain stages of that stream.

DISCHARGE MEASUREMENTS of Swiftcurrent creek at Sinclair's ranch (Upper Station), in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 12.....	M. H. French.....	10.0	35.40	1.61	3.42	57.0
May 4.....	E. J. Switzer.....	14.5	12.50	1.48	1.23	18.5
June 7.....	do.....	18.2	21.20	0.88	1.90	18.6c
July 11.....	do.....	15.1	9.39	1.45	1.26	13.6
Aug. 5.....	do.....	12.4	5.15	0.67	0.82	3.4
Sept. 30.....	do.....	12.0	6.50	0.67	1.90	4.4c
Nov. 6.....	do.....	11.3	5.52	1.14	1.98	6.3c

c Measurement affected by backwater caused by beaver dams below gauge.

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent creek at Sinclair's ranch (Upper Station), for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			4.67	96	1.30	31.0	2.27	44.0
2.....			4.06	74	1.30	21.0	2.02	35.0
3.....			3.77	64	1.29	19.5	2.01	32.0
4.....			3.62	58	1.23	18.5	1.91	30.0
5.....			3.42	55	1.19	17.7	1.92	29.0
6.....			3.34	52	1.16	16.7	2.62	50.0
7.....			3.29	51	1.14	16.3	1.90	18.6
8.....			3.25	51	1.13	16.3	1.90	17.5
9.....			3.22	51	1.09	16.0	1.82	15.0
10.....			3.21	52	0.99	15.7	1.84	16.0
11.....			3.21	54	0.98	15.5	3.86	78.0
12.....			3.42	57	0.98	16.0	3.49	48.0
13.....			3.34	56	0.96	17.5	2.14	42.0
14.....			3.07	55	0.95	20.0	2.04	38.0
15.....			2.84	52	0.99	26.0	1.93	34.0
16.....			2.72	48	1.99	34.0	1.89	30.0
17.....			2.57	40	1.67	40.0	1.84	24.0
18.....			2.41	34	1.29	32.0	1.81	18.7
19.....			2.28	32	1.24	25.0	1.77	15.0
20.....			2.12	30	1.22	19.0	1.73	13.5
21.....			1.94	28	1.20	17.0	1.76	15.0
22.....			1.80	27	1.11	16.2	1.95	19.5
23.....	6.97	200	1.71	27	1.08	14.5	2.06	28.0
24.....	7.07	200	1.53	27	1.01	11.5	1.76	24.0
25.....	7.87	180	1.46	27	1.26	10.0	1.75	23.0
26.....	7.86	165	1.42	28	1.31	40.0	1.65	23.0
27.....	6.57	152	1.38	29	4.51	100.0	1.61	21.0
28.....	6.07	143	1.39	30	3.90	80.0	1.55	18.0
29.....	5.27	124	1.41	32	3.26	61.0	1.45	15.7
30.....	4.97	116	1.45	33	2.61	56.0	1.40	15.0
31.....	4.82	109			2.57	50.0		

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent creek at Sinclair's ranch (Upper Station),
for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	1.36	16.0	0.89	8.0	0.78	4.8	1.60	4.0
2.....	1.41	20.0	0.89	7.0	0.78	5.3	1.93	4.5
3.....	2.46	37.0	0.88	5.8	0.79	5.7	1.92	20.0
4.....	2.05	30.0	0.87	4.6	0.80	6.4	2.28	28.0
5.....	1.81	28.0	0.82	3.4	0.83	7.0	2.03	30.0
6.....	2.06	33.0	0.79	3.5	0.80	6.4	2.38	30.0
7.....	1.61	21.0	0.78	3.8	0.78	6.0	2.35	28.0
8.....	1.55	20.0	0.76	5.2	0.77	5.8	1.93	14.0
9.....	1.54	19.0	0.93	13.0	0.78	5.7	1.92	13.5
10.....	1.51	15.6	1.48	19.0	0.79	5.9	1.90	13.1
11.....	1.26	13.6	0.93	13.0	0.77	6.0	1.93	13.1
12.....	1.19	10.0	0.91	9.8	1.60	6.0	2.03	13.1
13.....	1.10	7.3	0.83	8.9	1.25	6.0	1.92	12.8
14.....	1.17	7.0	0.82	7.6	1.13	6.2	1.91	12.3
15.....	1.12	8.0	0.80	6.1	0.98	6.5	1.88	11.5
16.....	1.08	7.9	0.78	5.4	1.00	6.4	1.93	10.8
17.....	1.05	7.7	0.73	4.9	0.93	6.2	1.91	10.4
18.....	1.00	7.0	0.70	4.6	0.98	5.8	1.83	10.1
19.....	0.97	3.3	0.65	4.4	1.03	5.5	1.82	9.7
20.....	0.98	6.0	0.63	4.2	1.02	5.5	1.78	9.1
21.....	0.97	5.8	0.62	4.0	1.05	5.6	1.77	8.7
22.....	0.96	5.7	0.60	3.8	1.28	5.6	1.75	8.5
23.....	0.95	5.5	0.58	3.8	1.33	6.4	1.82	8.0
24.....	0.93	5.5	0.58	3.8	1.20	6.0	1.83	7.0
25.....	0.88	6.0	0.57	3.7	1.28	4.7	1.81	5.9
26.....	0.91	10.0	0.59	3.7	1.29	5.0	1.79	5.0
27.....	1.06	14.0	0.58	3.6	1.25	4.9	1.92	5.2
28.....	0.95	12.0	0.61	3.7	1.43	4.5	1.90	6.2
29.....	0.93	11.2	0.62	3.7	1.65	4.5	1.88	6.5
30.....	0.92	10.6	0.65	4.0	1.74	4.4	1.86	6.5
31.....	0.93	10.0	0.66	4.3	.....	.....	1.84	6.4

Owing to backwater from beaver dams below the gauge the daily discharge was determined from hydrograph.

MONTHLY DISCHARGE of Swiftcurrent creek at Sinclair's ranch (Upper Station), for 1916
(Drainage area 172 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (23-31).....	200	109.0	154.0	0.895	0.30	2,748
April.....	96	27.0	45.0	0.262	0.29	2,678
May.....	100	10.0	29.0	0.169	0.19	1,783
June.....	78	13.5	28.0	0.163	0.18	1,666
July.....	37	3.3	13.3	0.077	0.09	818
August.....	19	3.4	5.9	0.034	0.04	363
September.....	7	4.4	5.7	0.033	0.04	339
October.....	30	4.0	12.0	0.070	0.08	738
The period.....	.....	.....	.....	.....	1.21	11,133

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of Swiftcurrent creek at Sinclair's ranch
(Upper Station)

MONTH	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		1.81	5.2	4.40	3.40	9.4	3.5	12.0	5.7	349
November				6.50 ^c						
December										
January										
February										
March							154.0 ^h			
April				97.00 ^d	44.00	15.0 ^f	45.0			2,636
May		13.80 ^b		12.00	5.70	25.0	29.0		17.9	1,103
June	2.20 ^a	5.50	3.4 ^e	8.10	4.40	23.0	28.0		13.8	821
July	0.98	3.60	4.0	2.80	0.56	14.4	13.3		5.7	348
August	0.35	1.47	3.2	0.96	0.43	2.2	5.9		2.1	128
September	1.69	12.80	3.4	0.99	5.30	3.1	5.7		4.7	281
Total in acre-ft. . . .	255	2,142	985	6,391	3,798	5,220	10,611			5,666

^a 15-30.^b 9-31.^c 1-15.^d 8-30.^e 28-30.^f 13-30.^h 23-31.

LEWIS DITCH AT KLINTONEL

Location.—On NW. $\frac{1}{4}$ Sec. 34, Tp. 8, Rge. 22, W. 3rd Mer., about one thousand feet below the headgate.

Records available.—August 20, 1915, to September 11, 1915.

Gauge.—Staff fastened to a post at the left bank; zero elevation maintained at 94.25 feet since establishment.

Bench-mark.—Permanent iron bench-mark on the right bank about eight feet southeast of the gauge; assumed elevation 100.00 feet.

Discharge measurements.—Made by current-meter at the section, or by weir in the ditch.

Observer.—C. L. Lewis.

Remarks.—This ditch takes its supply from a spring which enters Bone creek above the gauging station, on that stream. It is understood that no water was diverted during 1916.

BONE CREEK AT LEWIS' RANCH

Location.—On the NW. $\frac{1}{4}$ Sec. 34, Tp. 8, Rge. 22, W. 3rd Mer., at Klintonel post office.

Records available.—July 1, 1908, to October 31, 1916.

Gauge.—Vertical staff; the elevation of the zero has been maintained at 95.02 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Slightly shifting.

Discharge measurements.—Made with current-meter or with weir at low stages.

Winter flow.—This station is not maintained during the winter.

Observer.—C. L. Lewis.

Remarks.—About one second-foot flowing during first part of November.

DISCHARGE MEASUREMENTS of Bone creek at Lewis' ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 9	J. E. Caughey	5.1	1.90	1.16	0.27	2.20
June 7	do	5.4	3.04	0.71	0.27	2.20
July 24	do	6.2	2.71	0.39	0.18	1.05
Aug. 30	L. B. P. Miles				0.22	1.33 ^w
Oct. 27	do				0.29	2.60 ^e

^e Discharge estimated.^w Discharge determined by using an 18-inch weir.

DAILY GAUGE HEIGHT AND DISCHARGE of Bone creek at Lewis' ranch, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	0.60	..... i	0.53	7.4	0.30	2.80	0.29	2.60
2.....	0.60	.....	0.43	5.4	0.29	2.60	0.26	2.00
3.....	0.59	.....	0.44	5.6	0.28	2.40	0.26	2.00
4.....	0.59	.....	0.35	3.8	0.30	2.80	0.25	1.80
5.....	0.58	.....	0.34	3.6	0.28	2.40	0.38	4.40
6.....	0.58	.....	0.34	3.6	0.28	2.40	0.31	3.00
7.....	0.58	.....	0.34	3.6	0.29	2.60	0.27	2.20
8.....	0.60	.....	0.36	4.0	0.26	2.00	0.25	1.80
9.....	0.65	.....	0.64	9.6	0.27	2.20	0.25	1.80
10.....	0.68	..... i	0.65	9.8	0.27	2.20	0.31	3.00
11.....	3.95g	.....	0.55	7.8	0.27	2.20	0.51	7.00
12.....	1.97	.....	0.45	5.8	0.27	2.20	0.33	3.40
13.....	0.95	.....	0.67	10.2	0.26	2.00	0.27	2.20
14.....	0.52	.....	0.50	6.8	0.27	2.20	0.25	1.80
15.....	0.43	.....	0.45	5.8	0.27	2.20	0.25	1.80
16.....	0.43	.....	0.34	3.6	0.35	3.80	0.26	2.00
17.....	0.43	.....	0.32	3.2	0.27	2.20	0.27	2.20
18.....	0.43	.....	0.39	4.6	0.26	2.00	0.26	2.00
19.....	0.50g	.....	0.34	3.6	0.25	1.80	0.24	1.67
20.....	1.56	28.0	0.31	3.0	0.26	2.00	0.24	1.67
21.....	1.86	34.0	0.30	2.8	0.26	2.00	0.24	1.07
22.....	0.95	15.8	0.30	2.8	0.26	2.00	0.34	3.60
23.....	0.75	11.8	0.29	2.6	0.34	3.60	0.29	2.60
24.....	0.52	7.2	0.29	2.6	0.29	2.60	0.28	2.40
25.....	0.51	7.0	0.29	2.6	0.40	4.80	0.26	2.00
26.....	0.56	8.0	0.29	2.6	0.48	6.40	0.24	1.67
27.....	0.60	8.8	0.29	2.6	0.47	6.21	0.23	1.54
28.....	0.67	10.2	0.33	3.4	0.57	8.20	0.23	1.54
29.....	0.60	8.8	0.32	3.2	0.36	4.00	0.28	2.40
30.....	0.55	7.8	0.29	2.6	0.32	3.20	0.26	2.00
31.....	0.53	7.4	.....	.....	0.34	3.60	.....	.....

i Stream frozen over.

g Ice going out.

No discharge records available, March 1 to 19.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Bone creek at Lewis' ranch, for 1916.—*Concluded.*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	0.25	1.80	0.19	1.10	0.20	1.16	0.24	1.67
2.....	0.20	1.16	0.22	1.42	0.19	1.10	0.26	2.00
3.....	0.35	3.80	0.22	1.42	0.30	2.80	0.26	2.00
4.....	0.23	1.54	0.22	1.42	0.21	1.29	0.27	2.20
5.....	0.21	1.29	0.20	1.16	0.21	1.29	0.27	2.20
6.....	0.20	1.16	0.23	1.54	0.25	1.80	0.29	2.60
7.....	0.21	1.29	0.23	1.54	0.23	1.54	0.30	2.80
8.....	0.22	1.42	0.20	1.16	0.22	1.42	0.28	2.40
9.....	0.19	1.10	0.27	2.20	0.24	1.67	0.27	2.20
10.....	0.18	1.05	0.26	2.00	0.22	1.42	0.30	2.80
11.....	0.18	1.05	0.25	1.80	0.22	1.42	0.30	2.80
12.....	0.17	0.99	0.22	1.42	0.23	1.54	0.27	2.20
13.....	0.17	0.99	0.21	1.29	0.24	1.67	0.26	2.00
14.....	0.17	0.99	0.23	1.54	0.23	1.54	0.25	1.80
15.....	0.18	1.05	0.23	1.54	0.23	1.54	0.25	1.80
16.....	0.16	0.94	0.22	1.42	0.22	1.42	0.24	1.67
17.....	0.17	0.99	0.21	1.29	0.21	1.29	0.25	1.80
18.....	0.23	1.54	0.21	1.29	0.21	1.29	0.25	1.80
19.....	0.19	1.10	0.20	1.16	0.20	1.16	0.25	1.80
20.....	0.18	1.05	0.20	1.16	0.20	1.16	0.26	2.00
21.....	0.18	1.05	0.23	1.54	0.21	1.29	0.26	2.00
22.....	0.20	1.16	0.23	1.54	0.21	1.29	0.25	1.80
23.....	0.18	1.05	0.23	1.54	0.22	1.42	0.25	1.80
24.....	0.18	1.05	0.22	1.42	0.22	1.42	0.25	1.80
25.....	0.16	0.94	0.22	1.42	0.22	1.42	0.25	1.80
26.....	0.29	2.60	0.22	1.42	0.23	1.54	0.25	1.80
27.....	0.32	3.20	0.21	1.29	0.36	4.00	0.25	1.80
28.....	0.23	1.54	0.20	1.16	0.26	2.00	0.29	2.60
29.....	0.26	2.00	0.20	1.16	0.24	1.67	0.25	1.80
30.....	0.21	1.28	0.22	1.42	0.24	1.67	0.24	1.67
31.....	0.20	1.16	0.20	1.16	.....	.....	0.24	1.67

MONTHLY DISCHARGE of Bone creek at Lewis' ranch, for 1916

(Drainage area 17 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (20-31).....	34.0	7.00	12.90	0.759	0.34	307
April.....	10.2	2.60	4.60	0.271	0.30	274
May.....	8.2	1.80	3.00	0.176	0.20	184
June.....	7.0	1.07	2.40	0.141	0.16	143
July.....	3.8	0.94	1.39	0.082	0.09	85
August.....	2.2	1.10	1.42	0.084	0.10	87
September.....	4.0	1.10	1.57	0.092	0.10	93
October.....	2.8	1.67	2.00	0.118	0.14	123
The period.....	.....	.....	.....	.....	1.43	1,296

MONTHLY DISCHARGE in Second-feet of Bone creek at Lewis' ranch

MONTH	1907-8	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October..		6.50	1.45	1.47	1.57	1.56	1.44	1.55	1.97	2.00	2.20	133
November					1.23 ^h	1.41 ^d						
December												
January												
February												
March		6.40 ^a		16.70 ^b			8.20 ^e	0.83 ^f	12.90 ^g			
April		5.90	2.50	23.00	35.00	15.80 ^c	5.90	4.90	4.60		11.70	694
May		6.10	2.40	2.50	5.70	2.80	2.70	2.10	3.00		3.40	211
June			6.50	2.20	1.95	2.90	1.30	2.20	2.40		2.70	161
July	1.67	2.60	1.15	1.29	2.00	1.36	0.54	1.50	1.39		1.50	92
August	2.20	1.48	1.34	1.26	1.61	1.12	0.54	0.87	1.42		1.32	81
Sept.	1.82	1.51	1.50	2.50	1.82	1.24	1.16	1.37	1.57		1.61	96
Total in Acre-feet.	344	1,932	759	2,250	3,073	1,516	1,143	907	1,294			1,468

^a 26-31.^b 25-31.^c 4-30.^d 1-15.^e 12-31.^f 12-31.^g 20-31.^h 1-11.

SWIFTCURRENT CREEK AT SINCLAIR'S RANCH (LOWER STATION)

Location.—On the NW. $\frac{1}{4}$ Sec. 17, Tp. 10, Rge. 19, W. 3rd. Mer., and below the mouth of Bone creek.

Records available.—Open water flow from May 27, 1910, to October 31, 1916.

Gauge.—Chain gauge, attached to floor of highway bridge; the zero of the gauge was maintained at 85.73 feet during 1913-16.

Bench-mark.—Permanent iron bench-mark located on the right bank about six hundred feet up stream from the bridge; assumed elevation 100.00 feet.

Channel.—Permanent.

Discharge measurements.—Made with current-meter from bridge or by wading, and with a weir at very low stages.

Winter flow.—This station is not maintained during the frozen season.

Observer.—Mrs. K. Sinclair.

DISCHARGE MEASUREMENTS of Swiftcurrent creek at Sinclair's ranch (Lower Station), in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 12	M. H. French	25.0	89.50	1.95	3.05	175.0
May 4	E. J. Switzer	19.0	45.10	1.07	2.89	48.0
June 7	do	20.5	60.63	1.25	3.64	76.0
July 11	do	18.5	43.30	0.80	2.92	35.0
Aug. 5	do	18.1	32.54	0.42	2.36	13.7
Sept. 30	do	18.3	36.56	0.57	2.72	21.0
Nov. 6	do	18.0	34.80	0.63	2.61	22.0

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent creek at Sinclair's ranch
(Lower Station), for 1916

DAY	March		April		May		June	
	Gauge Height	Dis- charge	Gauge Height	Dis- charge	Gauge Height	Dis- charge	Gauge Height	Dis- charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			7.57	415	3.08	43.0	4.21	114
2.....			6.95	390	3.06	42.0	4.18	112
3.....			6.67	340	2.99	39.0	4.13	109
4.....			5.57	200	2.89	34.0	3.96	97
5.....			5.00b	171	2.84	31.0	3.79	86
6.....			5.02	172	2.83	31.0	4.74	152
7.....			4.65	146	2.80	30.0	3.64	76
8.....			4.30	121	2.78	29.0	3.60	74
9.....			4.13	109	2.64	23.0	3.56	71
10.....			3.97	98	2.59	21.0	3.66	77
11.....			4.03	102	2.58	21.0	5.87	234
12.....			5.05	175	2.57	20.0	4.43	130
13.....			5.15	182	2.55	19.5	3.48	66
14.....			4.95	167	2.50	17.8	3.46	65
15.....			4.87	162	2.91	35.0	3.30	55
16.....			4.65	146	4.28	119.0	3.26	53
17.....			4.27	119	3.35	58.0	3.23	51
18.....			3.95	96	3.00	39.0	3.18	48
19.....			3.87	91	2.93	36.0	2.96	37
20.....			3.80	87	2.90	34.0	2.95	37
21.....			3.61	74	2.84	31.0	2.97	38
22.....			3.43	63	2.80	30.0	3.51	68
23.....			3.32	56	2.77	28.0	3.68	79
24.....	8.85b	590	3.29	55	2.75	27.0	3.16	47
25.....	8.80	580	3.18	48	2.90	34.0	3.17	48
26.....	8.60	560	3.11	45	3.96	97.0	3.16	47
27.....	8.45	530	3.01	40	6.47	277.0	3.13	46
28.....	8.25	500	3.02	40	5.52	208.0	3.15	47
29.....	7.95	460	3.11	45	4.89	163.0	3.12	45
30.....	7.75	430	3.13	46	4.62	144.0	3.10	44
31.....	7.65	420			4.60	142.0		

b-b Ice conditions. Discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent creek at Sinclair's ranch
I (Lower Station), for 1916.—*Concluded.*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	3.04	42 0	2.69	25.0	2.41	15.0	2.79	29 0
2.....	3.09	44.0	2.64	23.0	2.43	15.6	2.95	37.0
3.....	4.14	110.0	2.51	18.1	2.42	15.3	3.31	56.0
4.....	3.76	84.0	2.49	17.5	2.40	14.7	3.84	89.0
5.....	3.67	78.0	2.36	13.6	2.61	22.0	3.88	92.0
6.....	3.99	99 0	2.35	13.3	2.46	16.5	3.91	94.0
7.....	3.27	53.0	2.34	13.1	2.45	16.2	3.73	82.0
8.....	2.94	36.0	2.34	13.1	2.43	15.6	2.96	37.0
9.....	2.93	36.0	2.95	37.0	2.41	15.0	2.95	37.0
10.....	2.91	35.0	3.31	56.0	2.44	15.9	2.85	32.0
11.....	2.92	35 0	2.94	36.0	2.42	15.3	2.63	22.0
12.....	2.79	29.0	2.79	29.0	2.41	15.0	2.56	19.9
13.....	2.66	24.0	2.75	27.0	2.43	15.6	2.41	15.0
14.....	2.63	22.0	2.55	19.5	2.45	16.2	2.26	11.3
15.....	2.52	18.5	2.47	16.8	2.46	16.5	2.23	10.7
16.....	2.44	15.9	2.45	16.2	2.47	16.8	2.15	9.4
17.....	2.32	12.6	2.41	15.0	2.45	16.2	2.31	12.3
18.....	2.26	11.3	2.36	13.6	2.46	16.5	2.46	16.5
19.....	2.32	12.6	2.33	12.8	2.44	15.9	2.54	19.2
20.....	2.34	13.1	2.28	11.7	2.42	15.3	2.67	24.0
21.....	2.40	14.7	2.26	11.3	2.42	15.3	2.65	23.0
22.....	2.41	15.0	2.25	11.1	2.44	15.9	2.46	16.5
23.....	2.38	14.1	2.23	10.7	2.46	16.5	2.43	15.6
24.....	2.35	13.3	2.22	10.6	2.45	16.2	2.42	15.3
25.....	2.32	12.6	2.21	10.4	2.46	16.5	2.44	15.9
26.....	2.45	16.2	2.20	10.2	2.47	16.8	2.44	15.9
27.....	3.06	42.0	2.24	10.9	2.49	17.5	2.58	21.0
28.....	2.94	36.0	2.23	10.7	2.95	37.0	2.68	24.0
29.....	2.89	34.0	2.22	10.6	2.83	31.0	2.57	20.0
30.....	2.85	32.0	2.23	10.7	2.52	26.0	2.54	19.2
31.....	2.78	29.0	2.25	11.1	.....	.....	2.51	18.1

MONTHLY DISCHARGE of Swiftcurrent creek at Sinclair's ranch (Lower Station), for 1916
(Drainage area 366 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Persquare Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (24-31).....	590	420.0	508.0	1.390	0.41	8 061
April.....	415	40.0	133.0	0.363	0.40	7,914
May.....	277	17.8	61.0	0.167	0.19	3,751
June.....	234	37.0	75.0	0.205	0.23	4,463
July.....	110	11.3	35.0	0.096	0.11	2,152
August.....	56	10.2	17.6	0.048	0.06	1,082
September.....	37	14.7	17.7	0.048	0.05	1,053
October.....	94	9.4	31.0	0.085	0.10	1,906
The period.....	.....	.....	.....	.....	1.55	30,382

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of Swiftcurrent creek at Sinclair's ranch
(Lower Station)

MONTH	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		13.8	26.0	24.0	13.10	33.0	28.0	31	24.0	1,476
November.....				34.0 ^d						
December.....										
January.....										
February.....										
March.....						350.0 ^f	508.0 ^h			
April.....				40.0 ^e	102.00	83.0	133.0		106.0	6,309
May.....	14.9 ^a	38.0 ^b	80.0 ^c	31.0	22.00	52.0	61.0		42.0	2,560
June.....	14.3	22.0	39.0	22.0	1.86	64.0	75.0		34.0	2,169
July.....	7.2	17.0	16.9	11.7	2.90	44.0	35.0		19.2	1,182
August.....	7.2	12.2	10.2	5.1	1.08	9.4	17.6		9.0	551
September.....	12.7	30.0	15.1	8.0	14.10	15.7	17.7		16.2	963
Total in Acre-feet	2,644	7,234	9,022	7,873	10,438	21,005	30,184			15,210

^a 27-31.^b 12-31.^c 16-31.^d 1-15.^e 22-30.^f 28-31.^h 24-31.

SWIFTCURRENT CREEK NEAR SWIFT CURRENT (UPPER STATION)

Location.—On the SW. $\frac{1}{4}$ Sec. 12, Tp. 15, Rge. 14, W. 3rd Mer., above the water supply reservoir of the city of Swift Current.

Records available.—January 16, 1914, to December 31, 1916.

Gauge.—Vertical staff 50 feet up stream from bridge; zero elevation 91.95 feet; established April 7, 1916.

Bench-mark.—On upstream wing of left abutment; assumed elevation 105.00 feet. Marked "B. M. 105.00" with white paint.

Control.—Permanent

Discharge measurements.—At high stages from bridge; at low stages by wading or by weir.

Winter flow.—Affected by ice.

Observer.—Mrs. E. Mackintosh.

Remarks.—Open water discharge computed from hydrograph.

DISCHARGE MEASUREMENTS of Swiftcurrent creek near Swift Current (Upper Station), in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 8.....	W. R. McCaffrey.....	9.0	4.55	1.17	2.05 ^b	5.30
Jan. 22.....	do.....	10.0	1.50	0.44	2.78	0.66
Feb. 4.....	H. W. Rowley.....	2.5	0.56	0.39	2.86	0.22
Feb. 18.....	do.....	48.0	11.50	0.51	3.70	5.90
Mar. 6.....	do.....	85.0	60.80	1.17	3.91 ^b	71.00
Mar. 22.....	E. J. Switzer.....	95.0	369.00	2.86	9.89	1,058.00
April 6.....	do.....	70.0	206.00	1.32	3.42	281.00
May 5.....	do.....	67.0	132.00	0.71	2.81	94.00
June 9.....	do.....	47.7	72.20	1.53	3.02	111.00
July 5.....	do.....	72.8	259.00	1.48	4.45	383.00
July 31.....	do.....	48.0	69.00	1.22	3.03	84.00
July 31.....	do.....	51.5	79.60	1.18	3.03	90.00
Aug. 11.....	do.....	47.5	71.50	1.23	3.06	88.00
Oct. 13.....	F. R. Shenstone.....	44.5	48.60	1.20	2.82	58.00
Nov. 8.....	do.....	37.0	23.40	0.26	2.16 ^b	6.20
Dec. 20.....	do.....	32.0	21.80	0.64	2.87 ^b	14.00

^b Ice conditions, Jan. 1 to Mar. 11 and from Nov. 8 to Dec. 31.

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent creek near Swift Current (Upper Station), for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	1.50 ^{bz}	6.50	2.15	0.35	.....	60	8.33	760	2.87	118	3.42	178
2....	1.20	6.30	2.00	0.20	.....	60	6.83	690	2.90	118	3.31	161
3....	1.20	6.10	.....	0.20	.....	60	6.33	520	2.85	110	3.21	150
4....	1.40	5.90	2.86	0.22	.....	60	.....	460	2.89	100	3.19	138
5....	1.50	5.80	2.95	0.70	.....	63	.....	360	2.81	94	3.18	126
6....	1.60	5.70	3.00	1.10	3.91	71	3.42	281	2.78	92	3.01	120
7....	1.85	5.50	3.10	1.50	3.87	76	4.26	406	2.75	88	3.00	116
8....	2.05	5.30	3.15	1.70	3.85	85	4.18	375	2.72	87	2.96	111
9....	.....	5.60	3.18	2.10	3.81	94	4.00	340	2.71	86	3.02	111
10....	.....	6.00	3.22	2.50	3.79	104	3.80	300	2.69	85	3.01	135
11....	2.08	6.30	3.30	2.90	3.75 ^b	200	4.00	340	2.66	85	3.16	163
12....	2.10	6.40	3.35	3.30	13.64	2,300	3.90	312	2.65	85	3.36	195
13....	2.15	6.30	3.40	3.60	.....	1,960	3.80	309	2.64	85	3.56	236
14....	2.25	6.10	3.45	4.10	.....	1,740	3.75	305	2.62	86	3.51	250
15....	.....	5.80	3.48	4.50	.....	1,520	3.71	300	2.62	89	3.42	190
16....	.....	5.50	3.55	5.00	.....	1,320	3.67	285	2.67	91	3.36	151
17....	3.00	4.90	4.00	5.40	.....	1,180	3.60	270	2.70	92	3.30	140
18....	3.00	4.10	3.70	5.90	.....	1,100	3.55	256	2.73	96	3.23	129
19....	2.95	3.10	3.95	10.00	.....	1,075	3.48	242	2.77	102	3.13	108
20....	2.90	1.90	3.92	17.00	.....	1,066	3.35	230	2.82	112	3.01	85
21....	.....	1.00	3.87	21.00	.....	1,062	3.27	202	2.79	108	2.92	68
22....	2.78	0.66	3.80	24.00	9.89 ^x	1,058	3.16	185	2.76	104	2.90	65
23....	2.75	0.70	.....	26.00	10.13	1,070	3.11	165	2.71	101	2.92	69
24....	2.71	0.70	.....	28.00	10.23	1,080	3.07	148	2.66	100	3.02	86
25....	2.68	0.70	.....	32.00	10.23	1,090	3.01	138	2.70	99	2.97	76
26....	2.60	0.70	.....	36.00	10.38	1,100	2.96	131	3.01	132	2.92	63
27....	2.50	0.70	.....	45.00	10.53	1,107	2.91	128	3.21	170	2.90	62
28....	2.43	0.60	.....	54.00	10.43	1,086	2.91	123	3.39	240	2.92	66
29....	2.30	0.55	.....	59.00	10.23	1,040	2.88	122	3.57	270	3.02	90
30....	.....	0.50	.....	.....	9.98	900	2.86	120	3.51	242	3.22	130
31....	.....	0.45	.....	.....	9.43	820	.....	.....	3.46	198	.....	.....

^{b-b} Ice conditions; discharge determined from winter hydrograph.^{x-x} Gauge heights taken from gauge above permanent control, 600 feet above present gauge.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent creek near Swift Current (Upper Station), for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	3.37	156	2.95	76	.....	42	2.61	47	2.45	22.0	2.70	9.2
2....	3.70	218	2.80	64	.....	42	2.64	47	2.38	18.0	2.71	9.5
3....	5.17	950	2.75	53	.....	42	2.67	48	2.33	12.0	2.72	9.4
4....	5.30	960	2.60	42	.....	42	2.71	49	2.28	9.0	2.74	9.3
5....	4.45	383	2.62	40	2.62	42	2.75	50	2.25	8.0	2.76	9.0
6....	4.12	346	.....	46	2.62	42	2.83	55	2.21	7.0	2.76	8.4
7....	3.92	335	.....	51	2.61	43	2.85	61	2.19	7.0	2.74	7.4
8....	3.92	335	.....	60	2.60	45	2.88	68	2.16 ^b	6.2	2.73	6.7
9....	4.00	360	.....	58	2.60	47	2.88	69	2.16	6.0	2.73	5.6
10....	5.12	932	.....	77	2.62	50	2.86	69	2.23	6.0	2.73	4.7
11....	4.75	870	3.06	88	2.65	49	2.84	66	2.28	6.6	2.75	3.9
12....	4.52	620	.....	87	2.63	47	2.82	61	2.43	7.3	2.76	3.7
13....	4.35	370	.....	83	2.62	45	2.82	58	2.50	8.1	2.71	3.9
14....	4.18	314	.....	81	2.62	45	2.81	58	2.58	8.8	2.68	4.4
15....	4.10	290	.....	80	2.61	45	2.81	59	2.58	9.5	2.66	5.1
16....	3.00	80	.....	78	2.61	45	2.78	60	2.60	10.0	2.68	6.1
17....	2.91	65	.....	76	2.61	45	2.76	60	2.63	10.2	2.68	7.7
18....	2.84	63	.....	72	2.60	45	2.74	58	2.65	10.3	.....	10.6
19....	2.79	58	.....	70	2.60	44	2.72	53	2.67	10.2	.....	12.7
20....	2.73	51	.....	68	2.59	44	2.71	46	2.68	10.0	2.87	14.0
21....	2.69	45	.....	64	2.59	43	2.68	45	2.68	9.4	2.94	14.7
22....	2.67	38	.....	60	2.58	42	2.66	42	2.68	8.5	2.96	14.8
23....	2.65	28	.....	57	2.56	40	2.64	39	2.68	7.8	2.96	14.9
24....	2.61	21	.....	54	2.55	39	2.63	38	2.68	7.7	2.98	14.7
25....	2.65	22	.....	51	2.55	39	2.62	38	2.68	7.6	2.99	14.4
26....	2.69	26	.....	50	2.54	40	2.62	38	2.68	7.4	2.94	14.0
27....	2.71	32	.....	48	2.56	45	2.61	38	2.68	7.5	2.87	13.6
28....	2.80	40	.....	46	2.60	47	2.61	39	2.68	7.8	2.87	13.1
29....	2.85	52	.....	46	2.60	47	2.58	37	2.68	8.3	2.85	12.7
30....	2.93	70	.....	45	2.60	47	2.54	35	2.70	8.7	2.83	12.4
31....	3.03	87	.....	42	.....	.....	2.48	30	.....	.....	2.78 ^b	12.0

b-b Ice conditions; discharge determined from winter hydrograph.

x Observer away, Aug. 6 to Sept. 4.

MONTHLY DISCHARGE of Swiftcurrent creek near Swift Current (Upper Station), for 1916

(Drainage area 975 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	6.5	0.45	3.8	0.004	0.00	234
February.....	59.0	0.20	13.7	0.014	0.02	788
March.....	2,300.0	6.00	826.0	0.847	0.98	50,789
April.....	760.0	120.00	293.0	0.301	0.34	17,435
May.....	270.0	85.00	118.0	0.121	0.14	7,256
June.....	250.0	62.00	126.0	0.129	0.14	7,498
July.....	960.0	21.00	265.0	0.272	0.31	16,294
August.....	88.0	40.00	62.0	0.064	0.07	3,812
September.....	50.0	39.00	44.0	0.045	0.05	2,618
October.....	69.0	30.00	50.0	0.051	0.06	3,074
November.....	22.0	6.00	9.1	0.009	0.01	542
December.....	14.9	3.70	9.8	0.010	0.01	603
The year.....					2.13	110,943

SWIFTCURRENT CREEK NEAR SWIFT CURRENT (LOWER STATION)

Location.—On the NW. $\frac{1}{4}$ Sec. 18, Tp. 15, Rge. 13, W. 3rd Mer., below the water supply dam of the city of Swift Current.

Records available.—May 5, 1913, to December 31, 1916.

Gauge.—Vertical staff; zero elevation of gauge has been maintained at 87.19 feet since establishment.

Bench-marks.—On rock; assumed elevation up to June 11, 1914, 100.00 feet. From June 12, 1914, to December 31 1915; another rock has been used having an elevation of 97.24 feet referred to the same datum. New bench-mark established May 8, 1916, on post; assumed elevation 100.00 feet, situated on right bank 50 feet back from gauge, and one foot out from horse barn.

Channel.—Permanent.

Discharge measurements.—With current-meter by wading or from bridge.

Winter flow.—Affected by ice.

Artificial control.—The flow of the creek at this point is affected to some extent by the city water supply dam.

Relation of gauge height to discharge.—Affected during spring by growth of weeds.

Observer.—Stanley Tite.

DISCHARGE MEASUREMENTS of Swiftcurrent creek near Swift Current (Lower Station), in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 8	W. R. McCaffrey	17.0	5.9	0.95	0.82 ^b	5.6
Jan. 22	do	14.0	4.9	0.53	0.76 ^b	2.6
Feb. 4	H. W. Rowley	9.0	3.6	0.59	0.55 ^b	2.1
Feb. 18	do	20.0	8.8	0.33	0.67 ^b	2.9
Mar. 6	do	55.0	91.0	0.63	1.82 ^b	58.0
April 7	E. J. Switzer	75.2	104.6	2.75	2.90	287.0
May 5	do	54.3	108.4	0.83	2.03	90.0
June 9	do	57.0	120.7	0.91	2.31	110.0
July 5	do	60.7	171.0	2.23	3.13	381.0
July 31	do	56.0	112.9	0.72	2.05	82.0
July 31	do				2.05	37.0 ^{ac}
Aug. 11	do		106.0	0.76	2.11	82.0
Oct. 13	F. R. Shenstone	39.0	62.4	0.94	2.01	58.0
Nov. 8	do	35.0	40.3	0.22	1.49 ^b	8.9
Dec. 20	do	25.0	17.8	0.79	1.61 ^b	14.0

^b Ice conditions, Jan. 1 to Mar. 11 and Nov. 8 to Dec. 31.

^{ac} Discharge determined by using dam as a weir.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent creek near Swift Current (Lower Station),
for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis- charge	Gauge Height	Dis- charge	Gauge Height	Dis- charge	Gauge Height	Dis- charge	Gauge Height	Dis- charge	Gauge Height	Dis- charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	0.90 ^b	8.10	0.60	1.70	1.75	53	3.22	416	2.07	101	2.49	163
2....	0.90	7.70	0.55	1.70	1.70	54	3.42	496	2.12	111	2.44	148
3....	0.90	7.30	0.60	1.70	1.55	56	3.22	416	2.10	105	2.39	134
4....	0.93	6.80.	0.55	2.10	1.65	57	3.37	476	2.09	102	2.29	112
5....	0.95	6.40	0.55	2.30	1.75	57	3.12	376	2.03	90	2.29	110
6....	0.90	6.00	0.57	2.50	1.82	58	2.97	316	2.02	88	2.29	109
7....	0.85	5.80	0.52	2.40	1.60	60	2.90	287 ^s	1.99	82	2.19	91
8....	0.82	5.60	0.52	2.50	1.45	65	2.77	244	1.97	79	2.29	108
9....	.....	5.20	0.62	2.40	1.45	70	2.82	268	1.97	78	2.31	110 ^s
10....	0.90	4.80	.....	2.40	1.55	80	2.87	290	1.97	77	2.29	107
11....	0.95	5.00	0.64	2.60	1.60 ^b	100	2.97	334	1.96	75	2.34	117
12....	0.90	5.10	0.64	2.70	7.72	2,216	2.92	320	1.93	70	2.39	128
13....	0.90	5.20	0.69	2.70	7.22	2,016	2.87	304	1.92	68	2.59	180
14....	0.90	6.00	0.69	2.60	5.72	1,416	2.87	310	2.03	83	2.79	246
15....	0.90	6.00	0.69	2.60	5.72	1,416	2.82	294	2.03	82	2.59	180
16....	0.85	5.30	0.65	2.60	4.72	1,016	2.72	260	2.04	83	2.39	128
17....	0.80	3.90	0.75	2.60	3.72	616	2.69	252	2.04	82	2.29	107
18....	0.70	3.00	0.67	2.90	3.62	576	2.67	249	2.04	82	2.19	89
19....	0.70	2.40	0.70	3.30	3.42	496	2.59	223	2.09	89	2.14	80
20....	0.70	2.30	0.75	4.20	3.52	536	2.57	220	2.06	84	2.09	73
21....	0.90	2.30	0.80	5.80	3.62	576	2.42	175	2.04	80	2.09	73
22....	0.76	2.60	0.80	8.00	3.72	616	2.37	162	1.99	71	2.09	73
23....	0.70	2.40	3.05	13.00	4.72	1,016	2.37	164	1.99	70	2.14	80
24....	.....	2.00	2.70	22.00	4.72	1,016	2.32	153	1.99	70	2.14	80
25....	0.70	1.70	2.55	28.00	3.72	616	2.22	130	.....	95 ^e	2.14	80
26....	0.70	1.70	2.20	35.00	3.22	416	2.22	131	2.29	120	2.14	80
27....	0.70	2.30	2.10	42.00	3.72	616	2.22	133	2.39	142	2.09	73
28....	0.70	2.30	2.10	47.00	4.72	1,016	2.17	121	2.59	199	2.14	80
29....	.....	2.30	2.00	50.00	4.22	816	2.12	111	2.79	266	2.19	89
30....	.....	2.30	.....	.....	4.02	736	2.12	112	2.69	229	2.29	107
31....	0.65	1.90	.....	.....	3.42	496	.....	.....	2.59	194	.....	.....

b-b Ice conditions; discharge determined from winter hydrograph.

^e Discharge estimated.^s Shifting conditions from April 7 to June 9.

DAILY GAUGE HEIGHT AND DISCHARGE of Swiftcurrent creek near Swift Current (Lower Station),
for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	2.48	150	2.09	73	1.69	29.0	1.74	33	1.89	47.0	1.69	11.2
2....	2.48	150	1.99	59	1.59	22.0	1.79	37	1.84	42.0	1.69	11.5
3....	3.58	560	1.89	47	1.49	16.7	1.84	42	1.84	42.0	1.69	11.8
4....	3.58	560	1.84	42	1.94	53.0	1.89	47	1.84	42.0	1.69	12.0
5....	3.13	380	1.89	47	1.72	31.0	1.89	47	1.79	37.0	1.66	12.0
6....	3.03	340	1.91	50	1.69	29.0	1.94	53	1.79	37.0	1.69	11.3
7....	3.03	340	1.85	43	1.24	18.3	1.94	53	1.79	37.0	1.69	10.6
8....	3.93	700	1.79	37	1.44	14.4	1.94	53	1.49	8.9	1.64	10.3
9....	4.38	880	1.89	47	1.59	22.0	1.92	51	1.84	8.3	1.59	9.7
10....	2.78	243	1.89	47	1.79	37.0	1.91	50	1.84 ^b	8.1	1.59	9.5
11....	2.49	152	2.11	76	1.78	36.0	1.91	50	1.79	8.1	1.54	9.5
12....	2.39	128	1.99	59	1.69	29.0	1.89	47	1.74	8.2	1.54	9.8
13....	2.24	98	1.99	59	1.72	31.0	2.01	62	1.64	8.6	1.54	10.4
14....	2.09	73	1.99	59	1.72	31.0	1.93	52	1.64	9.5	1.54	11.7
15....	2.04	66	1.89	47	1.69	29.0	1.91	50	1.69	10.1	1.54	12.6
16....	1.99	59	1.89	47	1.69	29.0	1.91	50	1.69	10.4	1.49	13.1
17....	1.99	59	1.89	47	1.74	33.0	1.89	47	1.69	10.5	1.49	13.5
18....	1.94	53	1.89	47	1.74	33.0	1.80	38	1.69	10.4	1.49	13.7
19....	1.94	53	1.89	47	1.74	33.0	1.79	37	1.69	10.0	1.49	13.7
20....	1.89	47	1.89	47	1.72	31.0	1.79	37	1.74	9.5	1.61	14.0
21....	1.84	42	1.89	47	1.64	25.0	1.84	42	1.74	8.9	1.54	13.7
22....	1.84	42	1.79	37	1.29	9.5	1.89	47	1.74	8.6	1.49	13.3
23....	1.84	42	1.79	37	1.29	9.5	1.89	47	1.79	8.5	1.39	12.7
24....	1.84	42	1.79	37	1.43	14.0	1.89	47	1.79	8.4	1.39	12.4
25....	1.84	42	.....	42 ^e	1.39	12.4	1.87	45	1.73	8.5	1.44	12.0
26....	1.89	47	1.89	47	1.49	16.7	1.84	42	1.69	8.7	1.49	12.0
27....	1.94	53	1.79	37	1.74	33.0	1.84	42	1.69	9.1	1.49	12.1
28....	1.99	59	1.69	29	1.74	33.0	1.89	47	1.69	9.6	1.49	12.2
29....	2.19	89	1.69	29	1.74	33.0	1.89	47	1.69	10.2	1.49	12.5
30....	2.19	89	1.59	22	1.74	33.0	1.89	47	1.69	10.7	1.49	12.7
31....	2.05	82	1.69	29	.....	.....	1.89	47	.....	.....	1.44 ^b	13.2

b-b Ice conditions; discharge determined from winter hydrograph.

e Discharge estimated.

MONTHLY DISCHARGE of Swiftcurrent creek near Swift Current (Lower Station), for 1916

(Drainage area 1,000 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	8.1	1.70	4.2	0.004	0.00	258
February.....	50.0	1.70	10.4	0.010	0.01	598
March.....	2,216.0	53.00	611.0	0.611	0.70	37,569
April.....	496.0	111.00	258.0	0.258	0.29	15,352
May.....	266.0	68.00	105.0	0.105	0.12	6,456
June.....	246.0	73.00	111.0	0.111	0.12	6,605
July.....	880.0	42.00	185.0	0.185	0.21	11,375
August.....	76.0	22.00	46.0	0.046	0.05	2,828
September.....	53.0	9.50	27.0	0.027	0.03	1,607
October.....	62.0	33.00	46.0	0.046	0.05	2,828
November.....	47.0	8.10	16.5	0.016	0.02	982
December.....	14.0	9.50	12.0	0.012	0.01	738
The year.....	.....	.....	.....	.....	1.61	87,196

SESSIONAL PAPER No. 25a

MEAN MONTHLY DISCHARGE in Second-feet of Swiftcurrent creek near Swift Current
(Lower Station)

MONTH	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		14.5	32	43.0	18.80	35.0	31.0	46.0	31.0	1,933
November				33.0		21.0	22.0	16.5	25.0	1,370
December				11.4		10.8	11.5	12.0	11.4	702
January					1.77	5.2	4.2		3.7	229
February					2.10	3.1	10.4		5.2	295
March		498.0a			102.00	118.0	611.0		277.0	17,032
April		427.0	255b	193.0c	228.00	231.0	258.0		286.0	17,018
May	38.00	76.0	136	55.0	41.00	72.0	105.0		75.0	4,597
June	21.00	40.0	91	45.0	29.00	73.0	111.0		59.0	3,493
July	15.00	28.0	27	34.0	6.50	85.0	185.0		54.0	3,340
August	8.65	16.7	24	10.5	0.73	26.0	46.0		18.9	1,166
September	18.20	49.0	30	4.7	20.00	21.0	27.0		24.0	1,440
Total in acre-ft.	6,110	43,944	25,737	22,835	27,101	42,405	86,570			52,615

a 27-31.

b 21-31.

c 9-30.

ANTELOPE LAKE DRAINAGE BASIN

General Description

Antelope lake is a small body of saline water, six miles long and from one to one and one-half miles wide, situated at an elevation of 2,300 feet above sea-level. It lies in a deep depression north of the main line of the Canadian Pacific Railway, in Township 15, Range 18, West of the 3rd Meridian, and drains an area of about 350 square miles.

The lake receives most of its supply from Bridge creek, which rises in the Cypress hills. The altitude of the source of this creek is 2,800 feet and it has an average fall of fifteen feet per mile.

The valley traversed by Bridge creek is narrow and quite shallow, rarely exceeding 100 feet in depth. The land lying along the creek bottom is very flat and liable to become inundated during periods of flood. The bench land is rolling prairie, cut up by innumerable coulees which drain the surrounding country into the main valley.

The mean annual rainfall amounts to about fourteen inches, most of which occurs during May, June and July.

The creek has only a small flow, and is dry along most of its course for several months during the year.

BRIDGE CREEK AT RAYMOND'S RANCH

Location.—On the SE. $\frac{1}{4}$ Sec. 33, Tp. 10, Rge. 22, W. 3rd Mer.

Records available.—April 8, 1911, to October 31, 1916.

Gauge.—Vertical staff; the elevation of the zero of the gauge has been maintained at 89.42 feet since establishment.

Bench-marks.—Permanent iron bench-mark 45 feet northwest of gauge; assumed elevation 100.00 feet.

Discharge measurements.—Made with current-meter at flood stages and with weir at ordinary stage.

Winter flow.—This station is not maintained during the winter.

Observer.—Mrs. C. Raymond.

DISCHARGE MEASUREMENTS of Bridge creek at Raymond's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 30.....	E. J. Switzer.....	9.0	6.60	0.54	1.39	3.60
May 3.....	do.....				0.70	0.42 <i>w</i>
May 10.....	do.....				0.67	0.36 <i>w</i>
June 8.....	do.....	4.3	3.14	0.74	0.79	2.30
June 15.....	do.....				0.71	0.84 <i>w</i>
July 10.....	do.....				0.61	0.36 <i>w</i>
July 12.....	do.....				0.57	0.28 <i>w</i>
Aug. 6.....	do.....				0.62	0.31 <i>w</i>

w Discharge determined by using an 18-inch weir.

DAILY GAUGE HEIGHT AND DISCHARGE of Bridge creek at Raymond's ranch, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec. ft.</i>
1.....			1.38	3.50	0.86	0.81	1.21	2.40
2.....			1.29	2.90	0.81	0.67	1.17	2.20
3.....			1.35	3.30	0.70	0.42	1.11	1.87
4.....			1.30	3.00	0.74	0.50	1.06	1.62
5.....			1.22	2.50	0.66	0.36	1.16	2.10
6.....			1.15	2.10	0.71	0.44	0.86	0.81
7.....	2.01 <i>b</i>	2.0	1.10	1.82	0.76	0.54	0.81	0.67
8.....	2.31	5.0	1.20	2.40	0.66	0.36	0.79	0.62
9.....	3.51	8.0	1.28	2.90	0.61	0.30	0.76	0.54
10.....	4.36	9.0	1.35	3.30	0.67	0.38	0.86	0.81
11.....	4.51	10.0	1.40	3.70	0.61	0.30	0.95	1.13
12.....	3.01	7.0	1.50	4.40	0.64	0.34	0.90	0.95
13.....	2.31	5.0	1.25	2.70	0.59	0.28	0.80	0.64
14.....	2.06	4.0	1.30	3.00	0.60	0.29	0.81	0.67
15.....	2.31 <i>b</i>	5.0	1.20	2.40	0.61	0.30	0.71	0.44
16.....	1.91	7.4	1.26	2.70	0.71	0.44	0.70	0.42
17.....	1.91	7.4	1.21	2.40	0.87	0.85	0.80	0.64
18.....	2.06	8.5	1.19	2.30	0.81	0.67	0.75	0.52
19.....	2.26	10.0	1.17	2.20	0.67	0.38	0.70	0.42
20.....	1.91	7.4	1.11	1.87	0.74	0.50	0.65	0.35
21.....	2.51	11.8	1.13	1.98	0.77	0.57	0.60	0.29
22.....	2.21	9.6	1.06	1.62	0.71	0.44	0.85	0.78
23.....	1.96	7.8	1.11	1.87	0.79	0.62	0.80	0.64
24.....	2.16	9.3	1.06	1.62	0.76	0.54	0.76	0.54
25.....	2.11	8.9	1.04	1.52	0.89	0.92	0.75	0.52
26.....	1.91	7.4	0.86	0.81	0.99	1.30	0.70	0.42
27.....	1.86	7.0	0.96	1.17	1.21	2.40	0.70	0.42
28.....	1.61	5.2	1.06	1.62	1.33	3.20	0.75	0.52
29.....	1.41	3.7	1.11	1.87	1.23	2.60	0.88	0.88
30.....	1.39	3.6	1.01	1.39	1.21	2.40	0.70	0.42
31.....	1.37	3.5			1.31	3.10		

b-b Ice conditions; discharge estimated.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Bridge creek at Raymond's ranch, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	0.69	0.41	0.56	0.26	0.66	0.36	0.86	0.81
2.....	0.71	0.44	0.54	0.25	0.64	0.34	0.86	0.81
3.....	0.74	0.50	0.51	0.23	0.66	0.36	0.91	0.99
4.....	0.71	0.44	0.56	0.26	0.71	0.44	0.91	0.99
5.....	0.66	0.36	0.66	0.36	0.76	0.54	0.96	1.17
6.....	0.66	0.36	0.62	0.31	0.71	0.44	0.96	1.17
7.....	0.69	0.41	0.61	0.30	0.66	0.36	0.91	0.99
8.....	0.66	0.36	0.57	0.27	0.66	0.36	0.89	0.92
9.....	0.64	0.34	1.06	1.62	0.71	0.44	0.86	0.81
10.....	0.61	0.30	0.86	0.81	0.71	0.44	0.81	0.67
11.....	0.56	0.26	0.76	0.54	0.66	0.36	0.81	0.67
12.....	0.57	0.27	0.71	0.44	0.69	0.41	0.79	0.62
13.....	0.50	0.23	0.71	0.44	0.71	0.44	0.76	0.54
14.....	0.50	0.23	0.66	0.36	0.76	0.54	0.81	0.67
15.....	0.48	0.22	0.66	0.36	0.71	0.44	0.81	0.67
16.....	0.50	0.23	0.61	0.30	0.76	0.54	0.81	0.67
17.....	0.55	0.25	0.69	0.41	0.76	0.54	0.86	0.81
18.....	0.65	0.35	0.86	0.81	0.74	0.50	0.81	0.67
19.....	0.60	0.29	0.91	0.99	0.71	0.44	0.77	0.57
20.....	0.58	0.27	0.81	0.67	0.66	0.36	0.81	0.67
21.....	0.55	0.25	0.71	0.44	0.69	0.41	0.76	0.54
22.....	0.53	0.24	0.66	0.36	0.71	0.44	0.76	0.54
23.....	0.50	0.23	0.66	0.36	0.69	0.41	0.81	0.67
24.....	0.55	0.25	0.64	0.34	0.66	0.36	0.81	0.67
25.....	0.63	0.33	0.66	0.36	0.71	0.44	0.79	0.62
26.....	0.65	0.35	0.69	0.41	0.76	0.54	0.79	0.62
27.....	0.70	0.42	0.66	0.36	0.81	0.67	0.81	0.67
28.....	0.75	0.52	0.61	0.30	0.79	0.62	0.81	0.67
29.....	0.70	0.42	0.57	0.27	0.76	0.54	0.76	0.54
30.....	0.65	0.35	0.61	0.30	0.81	0.67	0.79	0.62
31.....	0.60	0.29	0.64	0.34	.....	.....	0.76	0.54

MONTHLY DISCHARGE of Bridge creek at Raymond's ranch, for 1916

(Drainage area 6 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
May (7-31).....	11.80	2.00	6.90	1.150	1.07	342
April.....	4.40	0.81	2.40	0.400	0.45	143
May.....	3.20	0.28	0.88	0.147	0.17	54
June.....	2.40	0.29	0.84	0.140	0.16	50
July.....	0.52	0.22	0.33	0.055	0.06	20
August.....	1.62	0.23	0.45	0.075	0.09	28
September.....	0.67	0.34	0.46	0.077	0.09	27
October.....	1.17	0.54	0.73	0.122	0.14	45
The period.....	.....	.....	.....	.....	2.23	709

MEEN MONTHLY DISCHARGE in Second-feet of Bridge creek at Raymond's ranch

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		0.42 ^b	0.36	0.16	1.07	0.77	0.73	0.62	38
November.....			0.43 ^c						
December.....									
January.....									
February.....									
March.....			9.80 ^d	10.60	3.20 ^e	6.90 ^f		10.60	651
April.....	1.25 ^a	3.50	3.10	1.53	4.80	2.40		3.10	182
May.....	0.66	1.78	0.23	0.19	2.70	0.88		1.07	66
June.....	0.37	0.85	0.08	0.14	1.87	0.84		0.69	41
July.....	0.33	0.28	0.13	0.02	2.90	0.33		0.66	41
August.....	0.25	0.28	0.06	0.04	0.18	0.45		0.21	13
September.....	0.46	0.26	0.15	0.38	0.62	0.46		0.39	23
Total in acre-ft.....	126	437	316	798	973	711			1,055

^a 29-30.^b 1-24.^c 1-15.^d 29-31.^e 14-31.^f 7-31.

DIMMOCK BROTHERS' SOUTH DITCH FROM SPRING CREEK (NEAR SKULL CREEK P.O.)

Location.—On the SE. $\frac{1}{4}$ Sec. 16, Tp. 11, Rge. 21, W. 3rd Mer., and is two hundred and fifty feet northwest of the intake of the ditch and four hundred feet southeast of the flume.

Records available.—Incomplete records from 1912 to 1916.

Gauge.—Vertical staff; zero elevation maintained at 96.53 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—One channel at all stages, clay bottom.

Discharge measurements.—Made with current-meter or weir.

Observers.—Limmock Brothers.

Remarks.—There was no flow at any time the engineer visited the ditch in 1916, and no records were furnished by the owners of the ditch. Very little, if any, water was diverted.

BRIDGE CREEK AT GULL LAKE

Location.—On the SW. $\frac{1}{4}$ Sec. 24, Tp. 13, Rge. 19, W. 3rd Mer., at the highway bridge near the Canadian Pacific Railway station.

Records available.—During open water flow March 29, 1911, to October 31, 1916.

Gauge.—Vertical staff; zero maintained at 95.63 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Fairly permanent, but may be affected by vegetation.

Discharge measurements.—With the current-meter from bridge, or by wading; or with weir.

Winter flow.—No winter observations have been taken.

Observer.—J. R. Gaskell.

DISCHARGE MEASUREMENTS of Bridge creek at Gull Lake, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 6.....	E. J. Switzer.....	25.0	31.80	1.07	2.21	34.00
May 5.....	do.....	11.5	8.07	0.48	1.09	3.90
June 8.....	do.....	24.0	27.95	0.62	2.18	17.40
July 3.....	do.....	32.0	53.58	0.84	3.11	45.00
July 31.....	do.....	20.6	20.58	0.44	1.98	9.20
Aug. 14.....	do.....	15.0	13.48	0.45	1.55	6.00
Sept. 29.....	do.....				0.28	Nil
Nov. 5.....	do.....				0.65	0.05 ^e

^e Discharge estimated.

SESSIONAL PAPER No. 25a

DAILY GAUGE HEIGHT AND DISCHARGE of Bridge creek at Gull Lake, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1			3.01	42.0	1.10	6.1	2.10	17.9
2			2.85	36.0	1.12	6.0	2.32	23.0
3			2.68	31.0	1.11	5.3	2.38	24.0
4			2.55	27.0	1.10	4.7	2.41	25.0
5			2.41	23.0	1.09	3.9	2.44	25.0
6	2.03	14.1	2.21	34.0 _s	1.04	3.5	2.42	24.0
7	2.21	18.1	2.19	34.0	1.02	3.4	2.28	29.0
8	2.41	23.0	2.10	31.0	0.98	3.1	2.18	17.4 _s
9	2.64	30.0	2.02	29.0	0.96	2.9	2.11	15.8
10	2.91	38.0	1.97	27.0	0.94	2.8	2.44	24.0
11	3.33	53.0	1.89	25.0	0.94	2.8	2.63	30.0
12	3.51	59.0	1.80	23.0	0.93	2.7	2.64	30.0
13	3.34	53.0	1.76	22.0	0.92	2.6	2.60	29.0
14	3.11	45.0	1.74	21.0	0.90	2.4	2.56	27.0
15	3.03 _b	35.0	1.72	21.0	0.88	2.2	4.52	93.0
16	2.88	28.0	1.62	18.4	0.89	2.2	2.47	25.0
17	2.61	22.0	1.52	16.0	1.32	6.5	2.49	25.0
18	2.53	20.0	1.49	15.2	1.28	5.8	2.40	23.0
19	2.98 _b	30.0	1.54	16.4	1.23	5.2	2.35	22.0
20	3.08	44.0	1.49	15.2	1.20	4.7	2.30	20.0
21	3.60	62.0	1.45	14.3	1.13	4.0	2.26	19.3
22	3.76	67.0	1.43	13.9	1.04	3.0	2.21	18.1
23	3.41	55.0	1.35	12.1	0.99	2.6	2.16	16.9
24	3.21	49.0	1.27	10.4	0.96	2.3	2.12	16.0
25	3.31	52.0	1.21	9.4	1.35	5.8	2.09	15.4
26	3.52	59.0	1.15	8.2	1.78	12.6	2.04	14.3
27	3.76	67.0	1.13	7.8	1.90	14.8	1.98	13.0
28	3.58	61.0	1.10	7.1	1.84	13.3		18.3 _c
29	3.48	58.0	1.18	7.9	1.76	11.5		24.0 _c
30	3.32	52.0	1.13	6.9	1.72	10.6		29.0 _c
31	3.18	48.0			1.65	9.2		

b-b Ice conditions; discharge estimated.*s* Shifting conditions, April 6 to June 8.*c* Discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Bridge creek at Gull Lake, for 1916.—*Concluded.*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....		34.0e	1.84	10.30	0.79	0.44	Dry	Nil
2.....		40.0e	1.74	8.70	0.77	0.37	"	"
3.....	3.11	45.0	1.62	7.00	0.75	0.30	"	"
4.....	3.19	46.0	1.52	5.60	0.77	0.37	"	"
5.....	2.79	34.0	1.42	4.50	0.73	0.24	0.63	0.03
6.....	2.91	38.0	1.37	4.00	0.71	0.17	0.71	0.17
7.....	2.75	33.0	1.33	3.60	0.68	0.10	0.83	0.60
8.....	2.71	32.0	1.23	2.80	0.69	0.12	0.97	1.20
9.....	3.07	44.0	1.76	9.10	0.68	0.10	1.01	1.39
10.....	2.95	40.0	1.98	13.00	0.67	0.09	0.94	1.07
11.....	2.95	40.0	1.95	12.40	0.63	0.03	0.87	0.76
12.....	2.89	38.0	1.79	9.50	0.59	Nil	0.83	0.60
13.....	2.83	36.0	1.65	7.40	0.52	"	0.79	0.44
14.....	2.75	33.0	1.55	6.00	0.47	"	0.75	0.30
15.....	2.76	34.0	1.42	4.50	0.41	"	0.74	0.27
16.....	2.67	31.0	1.35	3.80	0.37	"	0.73	0.24
17.....	2.49	25.0	1.26	3.00	0.32	"	0.70	0.14
18.....	2.36	22.0	1.16	2.30	0.29	"	0.69	0.12
19.....	2.16	16.9	1.09	1.82	0.28	"	0.77	0.37
20.....	2.48	25.0	1.01	1.39	0.28	"	0.83	0.60
21.....	2.46	25.0	0.95	1.11	0.27	"	0.83	0.60
22.....	2.32	21.0	0.93	1.02	0.23	"	0.81	0.52
23.....	2.18	17.4	0.93	1.02	Dry	"	0.77	0.37
24.....	2.24	18.9	0.91	0.93	"	"	0.75	0.30
25.....	2.12	16.0	0.89	0.85	"	"	0.71	0.17
26.....	2.30	20.0	0.88	0.81	"	"	0.67	0.09
27.....	2.50	26.0	0.88	0.81	"	"	0.63	0.03
28.....	2.54	27.0	0.87	0.76	"	"	0.60	Nil
29.....	2.45	24.0	0.83	0.60	0.28	"	0.57	"
30.....	2.22	18.4	0.82	0.56	Dry	"	0.59	"
31.....	1.98	13.0	0.80	0.48	.....	.....	0.55	"

e Discharge estimated.

MONTHLY DISCHARGE of Bridge creek at Gull Lake, for 1916

(Drainage area 213 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (6-31).....	67.00	14.10	44.00	0.207	0.20	2,269
April.....	42.00	6.90	20.00	0.094	0.10	1,190
May.....	14.80	2.20	5.40	0.025	0.03	332
June.....	93.00	13.00	24.00	0.113	0.13	1,428
July.....	46.00	13.00	29.00	0.136	0.16	1,783
August.....	13.00	0.48	4.20	0.020	0.02	258
September.....	0.44	0.00	0.08	0.000	0.00	5
October.....	1.39	0.00	0.33	0.002	0.00	20
The period.....					0.64	7,285

LAKE OF THE NARROWS DRAINAGE BASIN

General Description

Lake of the Narrows is a small lake three miles long and one and one-half miles wide, in Township 13, Range 22, West of the 3rd Meridian. It has a drainage area of about 200 square miles.

The principal stream in the basin is Skull creek, which rises in the eastern slope of Cypress hills. It flows through a narrow valley for the greater part of its course, but as it nears the lake, the valley widens out into large meadows. The surrounding country is rolling prairie.

In very dry years, such as 1910 and 1914, Skull creek goes dry for a short time. The mean annual precipitation in the drainage basin is about thirteen inches.

SKULL CREEK AT DOYLE'S RANCH

Location.—On the SE. $\frac{1}{4}$ Sec. 32, Tp. 10, Rge. 22, W. 4th Mer., near Thos. Doyle's house.

Records available.—April 8, 1911, to October 31, 1916.

Gauge.—Vertical staff fastened to post at left bank of creek; zero elevation of gauge 92.08 feet.

Bench-mark.—On stump located about forty feet from gauge on right bank; assumed elevation 100.00 feet.

Channel.—Composed of gravel and stones.

Discharge measurements.—Made with current-meter by wading about fifty feet below the gauge.

Observer.—Thos. Doyle.

DISCHARGE MEASUREMENTS of Skull creek at Doyle's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 30.....	E. J. Switzer.....	19.0	11.80	1.36	2.85	16.20
May 3.....	do	18.4	8.48	0.59	2.53	5.00
May 9.....	do	18.4	7.56	0.52	2.47	3.90
June 5.....	do	19.1	19.48	1.96	3.28	38.00
June 15.....	do	18.9	8.32	0.82	2.57	6.80
July 10.....	do	18.3	5.40	0.52	2.38	2.80
July 12.....	do	18.2	4.96	0.37	2.35	1.84
Aug. 6.....	do	4.8	1.75	0.97	2.34	1.69

DAILY GAUGE HEIGHT AND DISCHARGE of Skull creek at Doyle's ranch, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....				4.0	2.70	10.4		4.8 _e		6.6 _e
2.....				4.0	2.60	7.2	2.53	5.3	2.48	4.2
3.....				3.0	2.55	5.8	2.53	5.3	2.48	4.2
4.....				3.0	2.45	3.5	2.56	6.1	2.48	4.2
5.....			2.50	3.0	2.45	3.5	2.55	5.8	3.30	38.0
6.....			2.50	3.0	2.48	4.2	2.54	5.6	2.87	17.1
7.....			3.00	15.0	2.45	3.5	2.54	5.6		15.8 _e
8.....			3.00	25.0	2.55	5.8		4.6 _e	2.82	14.9
9.....			3.00	50.0	2.65	9.8	2.46	3.7	2.57	6.4
10.....			3.50 _b	100.0	2.73	11.5	2.47	3.9	2.72	11.1
11.....			6.25	160.0	2.75	12.2	2.46	3.7	2.71	10.8
12.....			4.90	128.0	2.75	12.2	2.48	4.2	2.86	16.6
13.....			4.00	77.0	2.75	12.2	2.46	3.7		12.6 _e
14.....			3.70	61.0	2.70	10.4	2.46	3.7	2.66	9.1
15.....			3.30	38.0	2.68	9.8		4.6 _e	2.57	6.4
16.....	5.00 _b	30.0	3.00	23.0	2.67	9.4	2.53	5.3	2.54	5.6
17.....	5.00	30.0	2.80	14.1	2.67	9.4	2.53	5.3		4.8 _e
18.....		28.0	2.86	16.6	2.67	9.4	2.51	4.8	2.48	4.2
19.....	4.50	25.0	2.65	8.8	2.65	8.8	2.51	4.8	2.46	3.7
20.....	4.40	23.0	3.65	58.0	2.61	7.5	2.48	4.2	2.46	3.7
21.....	4.30	22.0	4.05	80.0	2.56	6.1	2.47	3.9	2.44	3.3
22.....	4.30	22.0	3.48	48.0	2.56	6.1	2.47	3.9	2.44	3.3
23.....	4.30	22.0	3.35	41.0	2.56	6.1	2.55	5.8	2.43	3.1
24.....	4.20	20.0	2.90	18.4	2.55	5.8	2.52	5.1	2.44	3.3
25.....	3.90	15.0	2.72	11.0	2.55	5.8	2.87	17.1	2.43	3.1
26.....	3.70	12.0	3.00	23.0	2.54	5.6	2.87	17.1	2.44	3.3
27.....	3.40	10.0	3.45	47.0	2.54	5.6	2.95	21.0	2.44	3.3
28.....	3.00	7.0	3.15	31.0	2.55	5.8	2.87	17.1	2.43	3.1
29.....	2.80	5.0	2.85	16.2	2.53	5.3	2.68	9.8	2.46	3.7
30.....			2.70	10.4	2.49	4.4	2.67	9.4	2.46	3.7
31.....			2.70	10.4			2.66	9.1		

b-b Ice conditions, Feb. 16 to Mar. 10; discharge estimated.

e Discharge estimated.

SESSIONAL PAPER No. 25e

DAILY GAUGE HEIGHT AND DISCHARGE of Skull creek at Doyle's ranch, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	2.45	3.50	2.36	2.00	2.34	1.70	2.42	3.0
2.....	2.46	3.70	2.35	1.80	2.34	1.70	.....	3.4e
3.....	2.52	5.10	2.34	1.70	2.33	1.50	2.46	3.7
4.....	2.45	3.50	2.34	1.70	2.35	1.80	.....	3.7e
5.....	2.45	3.50	2.36	2.00	2.37	2.10	.....	3.7e
6.....	2.43	3.10	2.34	1.70	2.35	1.80	2.46	3.7
7.....	2.43	3.10	2.34	1.70	2.35	1.80	.....	3.7e
8.....	2.40	2.60	.....	3.50e	2.35	1.80	2.46	3.7
9.....	2.40	2.60	2.56	6.10	2.35	1.80	.....	3.8e
10.....	2.38	2.30	2.38	2.30	2.34	1.70	2.47	3.9
11.....	.....	2.00e	2.45	3.50	2.35	1.80	2.48	4.2
12.....	2.35	1.80	2.36	2.00	2.36	2.00	.....	4.2e
13.....	.....	1.80e	2.36	2.00	2.35	1.80	2.48	4.2
14.....	2.35	1.80	2.35	1.80	2.36	2.00	2.46	3.7
15.....	2.34	1.70	2.35	1.80	2.36	2.00	2.45	3.5
16.....	2.34	1.70	2.35	1.80	2.36	2.00	2.46	3.7
17.....	2.35	1.80	2.35	1.80	2.35	1.80	2.47	3.9
18.....	2.44	3.30	2.34	1.70	2.36	2.00	2.47	3.9
19.....	2.38	2.30	2.35	1.80	2.36	2.00	2.47	3.9
20.....	2.36	2.00	2.34	1.70	2.35	1.80	2.47	3.9
21.....	2.34	1.70	2.34	1.70	2.35	1.80	.....	4.2e
22.....	2.33	1.50	2.33	1.50	2.36	2.00	2.49	4.4
23.....	2.32	1.40	2.33	1.50	2.37	2.10	2.49	4.4
24.....	2.32	1.40	2.32	1.40	2.36	2.00	.....	4.2e
25.....	2.32	1.40	2.33	1.50	2.37	2.10	2.47	3.9
26.....	2.69	10.00	2.34	1.70	2.42	3.00	.....	3.9e
27.....	2.56	6.10	2.34	1.70	2.57	6.40	2.47	3.9
28.....	2.51	4.80	2.34	1.70	2.42	3.00	.....	4.3e
29.....	2.34	1.70	2.35	1.80	2.41	2.80	2.50	4.6
30.....	2.34	1.70	2.35	1.80	2.41	2.80	.....	4.5e
31.....	2.35	1.80	2.34	1.70	.....	.....	2.49	4.4

e Discharge estimated.

MONTHLY DISCHARGE of Skull creek at Doyle's ranch, for 1916

(Drainage area 20 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (16-29).....	30.0	5.00	19.4	0.970	0.51	539
March.....	160.0	3.00	36.0	1.800	2.08	2,214
April.....	12.2	3.50	7.4	0.370	0.41	440
May.....	21.0	3.70	6.9	0.345	0.40	424
June.....	38.0	3.10	7.8	0.390	0.44	464
July.....	10.0	1.40	2.8	0.140	0.16	172
August.....	6.1	1.40	2.0	0.100	0.12	123
September.....	6.4	1.50	2.2	0.110	0.12	131
October.....	4.6	3.00	3.9	0.195	0.22	240
The period.....	.....	.....	.....	.....	4.46	4,747

MEAN MONTHLY DISCHARGE in Second-feet of Skull creek at Doyle's ranch

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		2.80b	3.00	1.88	4.70	2.6	3.9	3.20	198
November.....			4.40d						
December.....									
January.....									
February.....						19.4h			
March.....				5.91e	15.00f	36.0		36.00	2,214
April.....	17.90a	9.20c	30.00	16.00	17.40	7.4		17.70	1,059
May.....	5.30	10.20	3.50	4.60	5.10	6.9		5.90	365
June.....	2.30	5.30	2.40	0.97	6.20	7.8		4.20	248
July.....	1.89	1.40	1.40	0.14	4.90	2.8		2.10	128
August.....	1.21	1.69	1.19	0.18	1.55	2.0		1.30	80
September.....	3.20	1.71	1.31	1.50	1.57	2.2		1.92	114
Total in acre-ft.....	1,661	1,526	2,724	1,741	2,883	4,667			4,406

a 8-30.

b 1-21.

c 22-30.

d 1-15.

e 13-31.

f 19-31.

h 16-29.

MANN DITCH

Location.—On NW. $\frac{1}{4}$ Sec. 32, Tp. 10, Rge. 22, W. 4th Mer., about one mile from Skull Creek post office.

Records available.—July 1, 1913, to October 31, 1915. No water used previous to 1915.

Gauge.—Vertical staff; zero maintained at elevation 98.10 feet since establishment.

Bench-mark.—Wooden plug on right bank of ditch; assumed elevation 100.00 feet.

Discharge measurements.—Made with current-meter or weir.

Observer.—James Mann.

Remarks.—No flow at time hydrometric engineer was in locality, and it is believed that very little, if any, water was diverted during 1916.

GORDON, IRONSIDES AND FARES DITCH FROM SKULL CREEK

Location.—On NW. $\frac{1}{4}$ Sec. 7, Tp. 12, Rge. 22, W. 3rd Mer., about three miles southeast of Crane Lake station.

Records available.—One discharge measurement was obtained on June 12, 1915.

Gauge.—Vertical staff situated on the right bank of the ditch about 500 feet below the headgate; zero elevation maintained at 94.01 feet since establishment.

Bench-mark.—Permanent iron bench-mark; also used as initial point of soundings, on the left bank of the ditch and 5.5 feet below the gauge. Assumed elevation 100.00 feet.

Channel.—One channel, light sandy loam bed.

Discharge measurements.—Made with meter or weir.

Observer.—Gordon, Ironsides and Fares.

Remarks.—This station was visited on August 28, 1916. There was no flow on that date, and it is believed that very little, if any, water was diverted during 1916.

CRANE LAKE DRAINAGE BASIN

General Description

Crane lake is one of the largest of the lakes which receive their supply from the drainage of the northern slope of the Cypress hills. It is situated in Township 13, Range 23, West of the 3rd Meridian and covers an area of some twenty-five square miles.

The lake has no outlet, is shallow, and the water is saline in character. It is fed by Piapot creek, which rises in the Cypress hills, flows northeastward, and is joined by Bear creek, in Section 18, Township 12, Range 23, West of the 3rd Meridian, before it reaches the lake.

The country to the north of the lake is rolling and of little use for agriculture, being the eastern end of a range of sand hills which extend northwestward some forty miles. South of the lake the country is rolling prairie, which is bare of tree growth, except along the creeks, where there is a small growth of willow and shrub. Closer to the hills the country becomes more broken and the tree growth increases, making the ravines and coulees at the head of the creeks natural reservoirs, which regulate the spring run-off considerably.

There are a number of irrigation schemes in operation and proposed, in this basin, also one or two industrial schemes along the main line of the Canadian Pacific Railway.

The mean annual precipitation of the northern part of the basin is about twelve inches, but in the hills this is exceeded. During the winter season, from November to April, the streams are frozen over.

BEAR CREEK AT UNSWORTH'S RANCH

Location.—On the SE. $\frac{1}{4}$ Sec. 18, Tp. 11, Rge. 23, W. 3rd Mer., at bridge about four miles from Piapot.

Records available.—June 22, 1908, to October 31, 1916.

Gauge.—Vertical staff; zero elevation has been maintained at 85.95 since establishment.

Bench-mark.—A circle of nails on the top of the stringer at the left abutment on the downstream side of the bridge; assumed elevation 100.00 feet.

Discharge measurements.—Made from the bridge or by wading with a current-meter or with a weir at low stages.

Winter flow.—This station is not maintained during winter.

Observer.—Miss A. Unsworth.

DISCHARGE MEASUREMENTS of Bear creek at Unsworth's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 29.....	E. J. Switzer.....	14.0	49.80	1.06	4.26	53.00
May 2.....	do.....	12.3	27.15	0.71	2.55	19.10
May 11.....	do.....	11.8	21.47	0.68	2.14	14.80
June 3.....	do.....	12.5	38.35	0.95	3.51	37.00
June 16.....	do.....	13.5	38.92	0.93	3.49	36.00
July 8.....	do.....	11.7	22.18	0.63	1.99	14.00
July 13.....	do.....	11.1	16.09	0.48	1.64	7.70
Aug. 4.....	do.....	10.7	14.81	0.39	1.39	5.80
Nov. 4.....	do.....	12.6	34.47	0.35	2.76	12.10

DAILY GAUGE HEIGHT AND DISCHARGE of Bear creek at Unsworth's ranch, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec. ft.</i>
1			3.03	2.0	4.43	57.0	2.52	20.0	4.22	52.0
2			.....x	Nil	3.28	32.0	2.55	21.0	3.97	46.0
3				"	2.03	13.4	2.52	20.0	3.54	37.0
4				"	2.78	24.0	2.55	21.0	3.42	35.0
5				"	2.83	25.0	2.55	21.0	3.32	33.0
6				"	2.91	26.0	2.52	20.0	6.67	126.0
7				"	2.58	21.0	2.41	18.5	4.32	54.0
8			.....x	10	2.62	22.0	2.39	18.3	4.02	47.0
9			5.58	60	2.97	27.0	2.26	16.4	3.67	40.0
10			6.78	130	3.47	36.0	2.26	16.4	4.12	50.0
11			10.73	302e	3.72	41.0	2.16	15.1	6.03	104.0
12			13.48	405	3.47	36.0	2.11	14.4	8.48	203.0
13			8.93	223	3.47	36.0	2.11	14.4	5.18	77.0
14			7.40	154	3.47	36.0	2.09	14.2	4.28	54.0
15	4.48	31e	5.88	99	3.47	36.0	2.11	14.4	3.81	43.0
16	10.08	200	5.43	84	3.21	31.0	2.26	16.4	3.48	36.0
17	11.28	230	4.23	52	2.91	26.0	2.56	21.0	3.23	31.0
18	12.63	250	4.03	48	3.41	35.0	2.49	19.7	3.08	29.0
19	10.43	205	3.45	35	3.26	32.0	2.26	16.4	2.88	26.0
20	9.78	190	4.93	70	3.11	29.0	2.16	15.1	2.75	24.0
21	9.23	175	8.32	195	2.86	25.0	2.07	13.9	2.43	18.8
22	8.23	160	8.23	191	2.81	24.0	2.10	14.3	3.32	33.0
23	7.88	145	6.13	107	2.73	23.0	2.22	15.9	4.08	49.0
24	6.67	105	4.98	71	2.56	21.0	2.82	25.0	3.03	28.0
25	5.98	72	3.73	41	2.49	19.7	3.52	37.0	3.08	29.0
26	4.13	26	3.48	36	2.45	19.1	4.72	64.0	2.68	22.0
27	4.23	28	5.88	99	2.44	19.0	6.47	119.0	2.58	21.0
28	4.43	30	5.55	88	2.42	18.7	6.65	126.0	2.45	19.1
29	3.68	13	4.28	54	2.42	18.7	6.77	130.0	3.68	40.0
30			4.43	57	2.44	19.0	5.12	75.0	3.53	37.0
31			4.47	58			4.92	70.0		

e-e Discharge estimated.

x-x Creek frozen solid; no gauge readings.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Bear creek at Unsworth's ranch, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	3.34	33.0	1.57	7.5	1.22	3.3	2.56	16.8
2	3.17	30.0	1.50	6.7	1.27	3.9	2.56	16.6
3	2.67	22.0	1.37	5.1	1.32	4.5	2.69	18.2
4	2.82	25.0	1.34	4.8	1.47	6.3	2.91	21.0
5	2.37	18.0	1.32	4.5	1.67	8.7	2.90	21.0
6	2.20	15.6	1.32	4.5	1.62	8.1	2.87	20.0
7	2.07	13.9	1.32	4.5	1.54	7.2	2.89	20.6
8	1.97	12.6	1.34	4.8	1.47	6.3	2.90	19.9
9	1.97	12.6	2.03	13.4	1.50	6.7	2.89	19.5
10	1.97	12.6	2.87	25.0	1.52	6.9	2.89	19.1
11	1.82	10.7	2.07	13.9	1.47	6.3	2.90	19.1
12	1.77	10.0	1.92	12.0	1.47	6.3	2.91	19.0
13	1.64	8.4	1.82	10.7	1.47	6.3	2.93	18.9
14	1.60	7.9	1.70	9.1	1.57	7.5	2.95	18.7
15	1.57	7.5	1.57	7.5	1.67	8.7	2.96	18.8
16	1.50	6.7	1.40	5.5	1.72	9.4	2.93	18.1
17	1.44	6.0	1.37	5.1	1.79	10.0s	2.91	17.6
18	1.42	5.7	1.67	8.7	1.86	10.6	2.89	17.2
19	2.54	20.0	1.92	12.0	1.93	11.3	2.87	16.6
20	3.17	30.0	1.67	8.7	1.93	11.0	2.83	15.8
21	2.72	23.0	1.42	5.7	2.01	12.5	2.81	15.2
22	2.20	15.6	1.36	5.0	2.11	13.0	2.81	15.0
23	1.50	6.7	1.32	4.5	2.19	13.8	2.77	14.3
24	1.44	6.0	1.27	3.9	2.37	16.0	2.77	13.9
25	1.42	5.7	1.30	4.3	2.39	16.1	2.77	13.6
26	2.54	20.0	1.32	4.5	2.43	16.5	2.79	13.8
27	3.17	30.0	1.34	4.8	2.51	17.2	2.81	13.8
28	2.72	23.0	1.32	4.5	2.91	23.0	3.06	16.9
29	2.20	15.6	1.30	4.3	2.79	21.0	2.98	15.5
30	2.02	13.3	1.24	3.6	2.56	17.3	2.91	14.5
31	1.84	10.9	1.17	2.8			2.89	13.8s

s-s Shifting conditions.

MONTHLY DISCHARGE of Bear creek at Unsworth's ranch, for 1916

(Drainage area 100 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (15-20)	250	13.0	124.0	1.240	0.69	3,688
March	405	Nil	86.0	0.860	0.99	5,288
April	57	13.4	28.0	0.280	0.31	1,666
May	130	13.9	34.0	0.340	0.39	2,091
June	203	18.8	48.0	0.480	0.54	2,856
July	33	5.7	16.4	0.154	0.18	947
August	25	2.8	7.2	0.072	0.08	443
September	23	3.3	10.5	0.105	0.12	625
October	21	13.6	17.2	0.172	0.20	1,058
The period					3.50	18,662

MEAN MONTHLY DISCHARGE in Second-feet of Bear creek at Unsworth's ranch

MONTH	1907-8	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		14.3	10.30	6.5	9.1	8.00	3.40	6.9	9.7	17.2	9.5	583
November					8.2 _g	8.70 _d						
December												
January												
February									124.0 _h			
March							36.00 _e	18.9 _f	86.0		86.0	5,288
April		77.0 _b	16.60	48.0 _c	170.0	126.00	34.00	50.0	28.0		71.0	4,203
May		55.0	8.50	38.0	39.0	13.70	10.00	15.7	34.0		27.0	1,641
June	6.3 _a	85.0	4.80	11.2	22.0	5.40	4.20	16.0	48.0		25.0	1,461
July	5.3	41.0	1.50	8.4	5.5	4.00	0.22	9.5	15.4		10.1	620
August	6.7	6.1	1.05	3.3	4.5	0.99	Nil	2.4	7.2		3.6	220
September	5.2	5.1	3.70	10.0	4.2	0.52	0.72	5.0	10.5		5.0	297
Total in acre-ft. .	1,158	13,728	2,800	5,658	15,480	9,717	4,574	6,797	18,200			14,313

a 22-30.

b 23-30.

c 21-30.

d 1-15.

e 12-31.

f 20-31.

g 1-15.

h 15-29.

NEEDHAM BROTHERS' DITCH FROM BEAR CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 30, Tp. 11, Rge. 23, W. 3rd Mer., about two miles south of Piapot.

Records available.—Discharge measurements only from 1911 to 1914, and complete records during the irrigation season of 1915 and 1916.

Gauge.—Vertical staff; zero elevation maintained at 88.63 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—One channel at all stages.

Discharge measurements.—Made with a weir or current-meter.

Observer.—Robert Needham.

Remarks.—Water was diverted from July 7 to July 14 only, in 1916.

DISCHARGE MEASUREMENTS of Needham Brothers' ditch from Bear creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
July 8	E. J. Switzer	11.2	11.78	0.60	1.79	7.0
July 13	do	7.7	5.95	0.42	1.34	2.5
Aug. 29	do					Nil

DAILY GAUGE HEIGHT AND DISCHARGE of Needham Brothers' ditch from Bear creek, for 1916

JULY			JULY		
Day	Gauge Height	Discharge	Day	Gauge Height	Discharge
7	1.11	1.24	11	1.90	8.80
8	1.79	7.10	12	1.90	8.80
9	1.90	8.80	13	1.34	2.50
10	1.90	8.80	14	1.85	8.00

Total discharge for period, 108 acre-feet.

SESSIONAL PAPER No. 25a

BRANIFF DITCH FROM BEAR CREEK

Location.—On the SE. $\frac{1}{4}$ Sec. 30, Tp. 11, Rge. 23, W. 3rd Mer.

Records available.—One discharge measurement in 1914.

Gauge.—Vertical staff at headgate; elevation of zero 95.91 feet.

Bench-mark.—On post, three inches in diameter, with spike driven in top; assumed elevation 100.00 feet.

Discharge measurements.—Made with current-meter by wading.

Observer.—D. Braniff.

Remarks.—Water used for five or six hours on June 4, 1916. Flow about 1 second-foot.

MCCARTHY, BERTRAM AND SALT WEST DITCH FROM BEAR CREEK

Location.—On NW. $\frac{1}{4}$ Sec. 29, Tp. 11, Rge. 23, W. 3rd Mer., about 300 feet down stream from the dam.

Records available.—Discharge measurements only in 1914. Records for irrigation season of 1915.

Gauge.—Vertical staff; zero elevation maintained at 96.84 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Clay with a growth of vegetation.

Discharge measurements.—Made with current-meter or weir.

Observer.—W. Salt.

Remarks.—This station visited on August 29, 1916, but there was no flow, but it is understood that a small quantity of water was diverted during the spring.

MCCARTHY, BERTRAM AND SALT EAST DITCH FROM BEAR CREEK

Location.—On the NW. $\frac{1}{4}$ Sec. 29, Tp. 11, Rge. 23, W. 3rd Mer., near Piapot and 300 feet northeast of dam, and 75 feet below headgate.

Records available.—For irrigation season of 1915, gauge heights only in 1916.

Gauge.—Vertical staff; zero elevation 95.10 feet.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Clay, with heavy growth of vegetation.

Discharge measurements.—Made with current-meter or weir.

Observer.—D. Bertram.

Remarks.—Gauge heights of water during 1916 as follows:—July 4, 2.40 feet; July 5, 3.90 feet; July 6, 3.70 feet; July 8, 3.40 feet. Estimated flow about 4 or 5 second-feet. Water used only from July 4 to July 8.

TRANTER SOUTH DITCH FROM PIAPOT CREEK

Location.—On the NW. $\frac{1}{4}$ Sec. 5, Tp. 10, Rge. 24, W. 3rd Mer.

Gauge.—Vertical staff located 450 feet below headgate on the left bank of the ditch; zero elevation maintained at 97.22 feet since establishment.

Bench-mark.—A wooden plug surrounded by stones on right bank of ditch, 4 feet up stream from gauge; assumed elevation 100.00 feet.

Channel.—One at all stages; gravel bed.

Discharge measurements.—Made with current-meter or weir.

Observer.—G. Tranter.

Remarks.—This station was established on May 20, 1915, but no records were obtained in 1915. No discharge measurements in 1916. Gauge heights, reported as follows:—May 22 to May 26, five days, 1.40 feet each day. It is believed that very little water was used during 1916.

TRANTER NORTH DITCH FROM PIAPOT CREEK

Location.—On NE. $\frac{1}{4}$ Sec. 7, Tp. 10, Rge. 24, W. 3rd Mer.

Gauge.—Vertical staff located 800 feet below the headgate on left bank of ditch; zero elevation maintained at 98.88 feet since establishment.

Bench-mark.—A six-inch log surrounded by stones on right side of ditch and 5 feet up stream from gauge; assumed elevation 100.00 feet.

Channel.—One at all stages; bed clean.

Discharge measurements.—Made with current-meter or weir.

Observer.—C. Tranter.

Remarks.—This station was established on May 20, 1915, but no records were obtained in 1915. No records were received for 1916, and it is believed that no water was used.

MOORHEAD DITCH FROM PIAPOT CREEK

Location.—On SE. $\frac{1}{4}$ Sec. 25, Tp. 10, Rge. 25, W. 3rd Mer., near the centre of the quarter-section and about 400 feet from the intake of the ditch.

Records available.—Discharge measurements only in 1912 to 1914, records for irrigation season of 1915, and partial records for 1916.

Gauge.—Vertical staff; zero elevation maintained at 95.42 feet.

Bench-mark.—On a three-inch post, used as I.P., driven into ground about one foot from gauge and surrounded by small stones; assumed elevation 100.00 feet.

Channel.—One permanent channel. Bed consists of small rocks of about two inches in diameter.

Discharge measurements.—Made with current-meter or weir.

Observer.—H. Moorhead.

Remarks.—No discharge measurements were obtained in 1916. The following gauge heights were reported:—June 8, 1.40 feet; June 14, 1.20 feet; June 21, 1.10 feet; June 28, 1.10 feet; July 5, 1.10 feet; July 12, 1.10 feet; July 15, water turned off. Estimated average flow, 3.0 second-feet.

FEARON DITCH FROM PIAPOT CREEK

Location.—On SW. $\frac{1}{4}$ Sec. 6, Tp. 11, Rge. 24, W. 3rd Mer., about 1,000 feet from the intake of ditch.

Records available.—Discharge measurements taken during the irrigation seasons of 1914 and 1915.

Gauge.—Vertical staff; zero maintained at elevation of 97.41 feet since establishment.

Bench-mark.—Top of post used as final point of measurements; assumed elevation 100.00 feet.

Channel.—Clay, covered with grass.

Discharge measurements.—Made with current-meter or weir.

Observer.—I. d. Fearon.

Remarks.—No records were received for 1916, and it is believed that no water was diverted.

BEVERIDGE WEST DITCH FROM PIAPOT CREEK

Location.—On the NW. $\frac{1}{4}$ Sec. 18, Tp. 10, Rge. 24, W. 3rd Mer., about 350 feet below point of intake.

Records available.—Irrigation seasons, June 5, 1911, to October 31, 1916.

Gauge.—Vertical staff; zero elevation maintained at 97.82 feet during 1915 and 1916.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Clay and gravel, permanent.

Control.—A permanent control has been placed on this ditch below the gauge.

Discharge measurements.—Made with current-meter or weir.

Observer.—D. Peveridge.

Remarks.—Water was used for five days only during 1916. The gauge heights were:—May 30, 0.78 foot; May 31, 0.78 foot; June 2, 0.68 foot; June 3, 0.68 foot; July 6, 0.85 foot. Average discharge about 0.75 second-foot.

CUMBERLAND DITCH FROM PIAPOT CREEK

Location.—On SW. $\frac{1}{4}$ Sec. 17, Tp. 11, Rge. 24, W. 3rd Mer., about 300 feet from the headgate of the ditch.

Records available.—Partial records from June 27, 1914, to date.

Gauge.—Vertical staff; zero maintained at 98.00 feet since establishment.

Bench-mark.—Wooden stake used for I.P.; assumed elevation 100.00 feet.

Channel.—Clay, fairly permanent.

Discharge measurements.—Made with meter and weir.

Observer.—Andrew Cumberland.

Remarks.—This station was visited once or twice during 1916, but there was no flow, and it is understood that no water was used during 1916.

PIAPOT CREEK AT CUMBERLAND'S RANCH

Location.—On the NE. $\frac{1}{4}$ Sec. 18, Tp. 11, Rge. 24, W. 3rd Mer.

Records available.—July 4, 1908, to October 31, 1916; from July 4, 1908, to May 12, 1909, the records were taken three-quarters mile up stream from the present gauge.

Gauge.—Vertical staff; zero elevation maintained at 89.75 feet during 1909-11, and at 88.75 feet during 1912-16.

Bench-marks.—Permanent iron bench-mark; assumed elevation 100.00 feet.

SESSIONAL PAPER No. 25a

Discharge measurements.—Made with a weir at low stages and with current-meter at ordinary stages.

Winter flow.—This station is not maintained during the winter.

Artificial control.—A log buried in the bed of the stream about fifteen feet below the gauge forms a control at this station.

Diversions.—Messrs. Fearon and Moorhead, D. Beveridge, Geo. Tranter and A. Cumberland divert water for irrigation purposes above this station.

Observer.—A. Cumberland.

DISCHARGE MEASUREMENTS of Piapot creek at Cumberland's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Fee.</i>	<i>Sec.-ft.</i>
Mar. 29.....	E. J. Switzer.....	12.5	11.60	1.06	1.91	12.3
April 29.....	do.....	12.5	9.93	1.23	1.73	12.2
May 12.....	do.....	11.4	6.28	0.76	1.38	4.8
June 2.....	do.....	13.3	20.12	1.28	2.39	26.0
June 16.....	do.....	12.9	19.68	1.05	2.13	21.0
July 7.....	do.....	12.9	13.22	0.57	1.63	7.5
July 13.....	do.....	13.2	4.36	0.54	1.40	2.4
Aug. 3.....	do.....	12.1	8.48	0.44	1.41	3.7
Aug. 28.....	do.....	12.8	4.28	0.72	1.42	3.1

DAILY GAUGE HEIGHT AND DISCHARGE of Piapot creek at Cumberland's ranch, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			12.0	1.83	10.8	1.69	8.0	2.48	2.48	31.0
2.....			13.0	1.73	8.6	1.68	7.8	2.39	28.0	28.0
3.....			13.0	1.72	8.5	1.65	7.2	2.21	22.0	22.0
4.....			14.0	1.76	9.6	1.66	7.4	2.09	16.2	16.2
5.....			14.0	1.68	8.0	1.59	6.0	2.64	36.0	36.0
6.....			15.0	1.71	8.8		5.5e	3.85	77.0	77.0
7.....			15.0	1.57	6.0	1.54	5.1	2.75	40.0	40.0
8.....			20.0	1.64	7.5	1.49	4.3	2.23	22.0	22.0
9.....			20.0	1.73	9.6	1.40	3.0	2.10	18.5	18.5
10.....			21.0	1.75	10.2	1.39	2.9	2.96	47.0	47.0
11.....			6.06	22.0g	1.80	11.5		2.8e	4.23	90.0
12.....			6.16	25.0g	1.87	13.4	1.38	2.8	4.2	86.0
13.....			5.15	15.0g	1.91	14.7	1.40	3.0	2.93	46.0
14.....			4.70	10.0g	1.90	14.5		3.2e	2.42	29.0
15.....				10.0g	1.88	14.1	1.43	3.4	2.21	22.0
16.....				15.0g	1.89	14.6		5.1e	2.13	19.4
17.....				20.0g	1.75	11.1	1.63	6.8	2.10	18.5
18.....				30.0g	2.02	18.7	1.52	4.8	1.89	13.2
19.....				50.0g	1.90	17.9	1.44	3.6	1.77	9.7
20.....			3.75	74.0	1.84	13.9	1.39	2.9	1.58	5.8
21.....			3.70	72.0	1.78	12.4	1.52	4.8	1.57	5.7
22.....	5.51b	18.0	2.82	42.0	1.72	11.1	1.47	4.0	1.93	13.7
23.....	5.20	16.0	2.24	23.0	1.64	9.4	1.65	7.2	2.66	37.0
24.....	5.15	15.0	2.03	16.4	1.62	9.1	1.93	13.7		26.0e
25.....	5.15	15.0	1.98	15.0	1.62	9.1	3.00	48.0	1.96	14.5
26.....		12.0	1.92	13.4	1.57	8.2	3.21	56.0	1.62	6.6
27.....		10.0	1.98	15.0	1.54	7.7	3.84	77.0	1.92	13.4
28.....		10.0	2.00	15.6	1.58	8.8s	3.38	61.0	1.89	13.0
29.....		10.0	1.91	12.3d	1.73	12.2d	3.97	82.0	1.88	12.4
30.....			1.64	6.5s	1.66	7.4	3.31	59.0	2.93	46.0
31.....				8.7e			2.77	41.0		

b-b Ice conditions; discharge estimated.

e- Discharge estimated.

g Ice going out.

d Actual measurement.

s-s Shifting conditions.

DAILY GAUGE HEIGHT AND DISCHARGE of Piapot creek at Cumberland's ranch, for 1916.—*Concluded.*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	2.07	17.6	1.55	5.3	1.39	2.90	.....	3.4e
2	1.78	10.0	1.48	4.2	1.38	2.80	1.43	3.4
3	2.20	22.0	1.41	3.1	1.37	2.60	1.52	4.8
4	2.38	27.0	1.38	2.8	1.42	3.30	1.54	5.1
5	1.86	11.9	1.41	3.1	1.58	5.80	1.51	4.7
6	1.69	8.0	.....	3.0e	1.50	4.50	1.66	7.4
7	1.63	6.8	1.38	2.8	1.46	3.90	1.73	8.9
8	1.59	6.0	1.36	2.5	1.41	3.10	1.60	6.2
9	1.63	6.8	2.76	40.0	1.39	2.90	1.56	5.5
10	.....	5.7e	2.90	45.0	1.42	3.30	1.54	5.1
11	1.50	4.5	2.70	38.0	1.41	3.10	1.54	5.1
12	1.46	3.9	1.90	12.9	1.33	2.20	1.62	6.6
13	1.40	3.0	1.73	8.9	1.35	2.40	1.64	7.0
14	1.38	2.8	1.63	6.8	1.37	2.60	1.76	9.5
15	1.35	2.4	1.54	5.1	1.38	2.80	1.72	8.6
16	1.32	2.0	1.39	2.9	1.34	2.30	1.62	6.6
17	1.63	6.8	1.48	4.2	.....	2.00e	1.54	5.1
18	.....	9.6e	2.40	28.0	1.30	1.80	1.55	5.3
19	1.88	12.4	1.80	10.4	1.35	2.40	1.52	4.8
20	1.63	6.8	1.62	6.6	1.29	1.68	1.52	4.8
21	1.49	4.3	1.54	5.1	1.32	2.00	1.51	4.7
22	1.43	3.4	1.51	4.7	1.32	2.00	1.50	4.5
23	1.35	2.4	1.46	3.9	1.29	1.68	1.49	4.3
24	1.36	2.5	1.52	4.8	.....	1.84e	1.48	4.2
25	1.36	2.5	1.39	2.9	1.32	2.00	1.47	4.0
26	1.43	3.4	1.46	3.9	1.32	2.00	1.48	4.2
27	6.78	177.0	1.46	3.9	1.46	3.90	1.66	7.4
28	2.33	26.0	1.42	3.3	.....	4.00e	.....	6.7e
29	1.89	13.0	1.41	3.1	1.48	4.20	1.59	6.0
30	1.66	7.4	.....	3.0e	1.43	3.40	.....	5.4e
31	1.62	6.6	.....	3.0e	.....	.....	1.51	4.7

e Discharge estimated.

MONTHLY DISCHARGE of Piapot creek at Cumberland's ranch, for 1916

(Drainage area 55 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Persquare Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (22-29)	18.0	10.00	13.2	0.240	0.07	209
March	74.0	6.50	22.0	0.400	0.46	1,353
April	18.7	6.00	10.9	0.198	0.22	649
May	82.0	2.80	17.7	0.322	0.37	1,088
June	90.0	5.70	29.0	0.527	0.59	1,726
July	177.0	2.00	13.7	0.249	0.25	842
August	45.0	2.50	8.9	0.162	0.19	547
September	5.8	1.68	2.8	0.051	0.06	197
October	9.5	3.40	5.6	0.102	0.12	344
The period	.....	.....	.....	.....	2.37	6,925

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of Piapot creek at Cumberland's ranch

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		2.70	0.90	3.8	2.60	0.71	2.8	3.6	5.6	2.8	173
November.....					2.30 ^e						
December.....											
January.....											
February.....								13.2 ^f			
March.....						12.60 ^c	9.5 ^d	22.0		22.0	1,353
April.....		4.20	9.90 ^a	36.06	53.00	6.30	6.5	10.9		16.2	963
May.....	16.5	1.04	5.70	16.0	6.40	1.54	2.3	17.7		8.4	517
June.....	39.0	0.78	3.40	10.1	1.79	0.51	9.3	29.0		11.7	700
July.....	17.0	0.64	4.50	3.9	0.69	0.07	11.6	13.7		6.5	400
August.....	3.5	0.77	1.96	3.7	0.43	0.04	2.2	8.9		2.7	166
Sept.....	2.7	0.96	5.40	2.2	0.44	0.73	2.8	2.8		2.3	134
Total in Acre-ft. .	4,776	672	1,820	4,335	3,978	1,120	2,591	6,802			4,406

^a 5-30.^b 4-30.^c 12-31.^d 15-31.^e 1-15.^f 22-29.

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Crane lake drainage basin, in 1916

Date	Engineer	Stream	Location	Width	Area of Section	Mean Velocity	Discharge
				<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
May 10	E. J. Switzer	East br. Bear creek	NE. 29-10-23-3	12.3	7.23	0.68	4.90
June 16	do	do	do	13.2	11.30	0.86	9.80
July 8	do	do	do	11.9	5.92	0.59	3.50
July 13	do	do	do	11.4	5.14	0.35	1.79
Aug. 4	do	do	do	5.5	1.83	0.61	1.12
May 10	do	West br. Bear creek	NW. 29-10-23-3	12.7	7.68	1.12	8.60
June 16	do	do	do	16.6	13.90	1.92	27.00
July 8	do	do	do	14.1	9.69	1.06	10.20
July 13	do	do	do	13.2	7.07	0.65	4.60
Aug. 4	do	do	do	9.6	6.14	0.63	3.90
April 29	do	Piapot creek.....	SE. 25-10-25-3	12.8	8.78	0.90	7.90
May 12	do	do	do	12.7	6.60	0.49	3.30
June 2	do	do	SE. 36-10-25-3	14.1	12.40	1.46	18.10
July 7	do	do	do	12.0	6.13	0.34	2.10
Aug. 3	do	do	do	7.4	1.44	0.56	0.83
July 13	do	Spring coulee.....	SE. 8-11-23-3	4.0	1.40	0.49	0.69
Aug. 4	do	do	do				0.71 ^w

^w Discharge determined by using an 18-inch weir.

HAY LAKE DRAINAGE BASIN

General Description

Hay lake is in Township 11, Range 25, West of the 3rd Meridian, and is fed by Hay creek, which rises in the Cypress hills. It is a comparatively small body of saline water of an approximate area of three square miles. Like most lakes in this locality it has no outlet.

The basin supplies water for a few small irrigation schemes, and also to the town of Maple Creek for domestic and industrial purposes, the water being piped some nine miles by means of a gravity system.

The annual precipitation averages about twelve inches.

HAMMOND WEST DITCH FROM EAST BRANCH OF HAY CREEK

Location.—On SW. $\frac{1}{4}$ Sec. 16, Tp. 10, Rge. 25, W. 3rd Mer., 12 feet from the dam.

Records available.—For irrigation season of 1915.

Gauge.—Vertical staff, three feet long; zero maintained at elevation 93.963 feet during 1915.

Bench-mark.—A three-quarter-inch iron bar on a gravel knoll 250 feet east of the weir in the west ditch, and midway between the east and west ditches. Protected by rocks. Assumed elevation 100.00 feet.

Channel.—One channel, heavy black loam, highly gravelled.

Discharge measurements.—Made directly from the ditch weir.

Observer.—G. R. Hammond.

Remarks.—This station was visited on August 26, 1916, but there was no flow, and it is believed that very little, if any, water was diverted during 1916.

HAMMOND EAST DITCH FROM EAST BRANCH OF HAY CREEK

Location.—On SW. $\frac{1}{4}$ Sec. 16, Tp. 10, Rge. 25, W. 3rd Mer., about 200 feet from intake of ditch.

Records available.—For irrigation season of 1915.

Gauge.—Vertical staff, three feet long; zero maintained at elevation 97.81 feet during 1915.

Bench-mark.—A three-quarter-inch iron bar on a gravel knoll midway between the east and west ditches and 250 feet west of the station; assumed elevation 100.00 feet.

Channel.—One channel with a gravelly clay bed.

Discharge measurements.—Made with current-meter or weir.

Observer.—G. R. Hammond.

Remarks.—This station was visited on August 26, 1916, but there was no flow and it is believed that very little, if any, water was diverted during 1916.

HAY CREEK AT HAY CREEK SCHOOL

Location.—On the SW. $\frac{1}{4}$ Sec. 29, Tp. 10, Rge. 25, W. 3rd Mer.

Records available.—March 24, 1911, to October 31, 1916.

Gauge.—Vertical staff; zero elevation has been maintained at 94.79 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Slightly shifting.

Discharge measurements.—Made with weir at ordinary stages and with a current-meter in high water periods.

Winter flow.—This station is not maintained during the winter.

Diversions.—The town of Maple Creek takes its water from springs at the head of this creek.

Observer.—Miss M. E. Fauquier.

DISCHARGE MEASUREMENTS of Hay creek at Hay Creek school, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 29.....	E. J. Switzer.....	9.0	4.35	1.06	1.60	4.70
April 27.....	do.....	8.0	2.45	0.46	1.37	1.13
May 13.....	do.....	.....	.....	.....	1.38	0.84 ^w
June 2.....	do.....	10.6	7.10	1.27	1.82	9.00
June 17.....	do.....	10.5	5.96	0.75	1.60	4.50
July 7.....	do.....	9.8	4.17	0.33	1.39	1.38
July 14.....	do.....	.....	.....	.....	1.26	0.30 ^w
Aug. 3.....	do.....	.....	.....	.....	1.19	0.18 ^w
Aug. 26.....	do.....	.....	.....	.....	1.23	0.20 ^w
Sept. 28.....	do.....	5.9	1.22	0.42	1.24	0.51
Nov. 3.....	do.....	6.3	1.64	0.62	1.32	1.02

^w Discharge determined by using an 18-inch weir.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Hay creek at Hay Creek school, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1			1.50	2.0	1.52	3.20	1.42	1.74	1.86	9.90
2			1.50	2.0	1.54	3.50	1.40	1.50	1.82	9.00
3			1.60	3.0	1.51	3.10	1.40	1.50	1.71	6.70
4			1.60	3.0	1.36	1.08	1.40	1.50	1.66	5.70
5			1.60	3.0	1.37	1.18	1.40	1.50	1.96	12.10
6			1.61	3.0	1.52	3.20	1.57	4.10	2.25	18.50
7			1.61	3.0	1.52	3.20	1.52	3.20	1.85	9.70
8			1.71	5.0	1.52	3.20	1.52	3.20	1.65	5.50
9			2.03 ^b	10.0	1.62	5.00	1.52	3.20	1.60	4.60
10			2.33	20.0	1.68	6.10	1.52	3.20	1.95	11.90
11			2.42	22.0	1.68	6.10	1.50	2.90	2.95	34.00
12			2.22	17.8	1.70	6.50	1.45	2.10	2.25	18.50
13			2.12	15.6	1.55	3.70	1.38	1.29	2.20	17.40
14			1.76	7.7	1.55	3.70	1.40	1.50	1.90	10.80
15			1.76	7.7	1.60	4.60	1.45	2.10	1.85	9.70
16			1.63	5.1	1.70	6.50	1.42	1.74	1.70	6.50
17			1.57	4.1	1.60	4.60	1.42	1.74	1.60	4.60
18			1.60	4.6	1.55	3.70	1.41	1.62	1.60	4.60
19			1.72	6.9	1.55	3.70	1.39	1.39	1.50	2.90
20			2.06	14.3	1.55	3.70	1.37	1.18	1.46	2.30
21			2.46	23.0	1.49	2.70	1.35	0.97	1.46	2.30
22			2.21	17.6	1.47	2.40	1.38	1.29	1.65	5.50
23			1.91	11.0	1.42	1.74	1.53	3.40	2.10	1.52
24			1.92	11.2	1.52	3.20	1.83	9.30	1.75	7.50
25			1.77	7.9	1.40	1.50	1.88	10.40	1.65	5.50
26			1.62	5.0	1.40	1.50	2.25	18.50	1.55	3.70
27			1.93	11.5	1.37	1.18	2.32	20.00	1.55	3.70
28	1.11 ^b	0.50	1.76	7.7	1.36	1.08		24.00 ^e	1.55	3.70
29	1.39	1.40	1.60	4.6	1.34	0.89	2.64	27.00	1.50	2.90
30	1.49	2.00	1.49	2.7	1.33	0.81	1.65	5.50	1.50	2.90
31			1.50	2.9			1.91	11.00		

b-b Ice conditions; discharge estimated.

e Discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Hay creek at Hay Creek school, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	1.61	4.80	1.26	0.35	1.10	0.07	1.18	0.15
2.....	1.56	3.90	1.21	0.20	1.10	0.07	1.18	0.15
3.....	1.73	7.10	1.19	0.16	1.10	0.07	1.23	0.25
4.....	1.53	3.40	1.16	0.12	1.14	0.10	1.31	0.64
5.....	1.43	1.86	1.16	0.12	1.10	0.07	1.31	0.64
6.....	1.39	1.39	1.21	0.20	1.10	0.07	1.31	0.64
7.....	1.39	1.39	1.21	0.20	1.10	0.07	1.32	0.72
8.....	1.36	1.08	1.11	0.08	1.05	0.04	1.33	0.81
9.....	1.36	1.08	1.76	7.70	1.08	0.06	1.30	0.56
10.....	1.35	0.97	1.51	3.10	1.10	0.07	1.28	0.46
11.....	1.32	0.72	1.31	0.64	1.08	0.06	1.27	0.40
12.....	1.35	0.97	1.22	0.22	1.08	0.06	1.27	0.40
13.....	1.26	0.35	1.19	0.16	1.09	0.06	1.27	0.40
14.....	1.26	0.35	1.16	0.12	1.12	0.09	1.27	0.40
15.....	1.12	0.09	1.04	0.04	1.12	0.09	1.26	0.35
16.....	1.33	0.81	1.15	0.11	1.12	0.09	1.25	0.30
17.....	1.27	0.40	1.42	1.74	1.12	0.09	1.24	0.27
18.....	1.12	0.09	1.31	0.64	1.08	0.06	1.24	0.27
19.....	1.15	0.11	.....	0.46 ^e	1.08	0.06	1.24	0.27
20.....	1.15	0.11	1.25	0.30	1.07	0.05	1.24	0.27
21.....	1.15	0.11	1.16	0.12	1.07	0.05	1.24	0.27
22.....	1.15	0.11	1.16	0.12	1.07	0.05	1.24	0.27
23.....	1.18	0.15	1.16	0.12	1.07	0.05	1.24	0.27
24.....	1.18	0.15	1.16	0.12	1.07	0.05	1.23	0.25
25.....	1.18	0.15	1.15	0.11	1.13	0.09	1.23	0.25
26.....	1.88	10.40	1.23	0.25	1.14	0.10	1.23	0.25
27.....	1.91	11.00	1.18	0.15	1.17	0.13	1.32	0.72
28.....	1.61	4.80	1.10	0.07	1.24	0.27	1.32	0.72
29.....	1.46	2.30	1.10	0.07	1.17	0.13	1.26	0.35
30.....	1.39	1.39	1.10	0.07	1.17	0.13	1.24	0.27
31.....	1.29	0.51	1.10	0.07	.....	.....	1.22	0.22

^e Discharge estimated.

MONTHLY DISCHARGE of Hay creek at Hay Creek school, for 1916

(Drainage area 22 square miles)

MONTH	DISCHARGE IN SECOND-FEET.				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (27-29).....	2.00	0.50	1.30	0.059	0.01	8
March.....	23.00	2.00	8.50	0.386	0.44	523
April.....	6.50	0.81	3.20	0.145	0.16	190
May.....	27.00	0.97	5.60	0.255	0.29	344
June.....	34.00	2.30	8.60	0.391	0.44	512
July.....	11.00	0.09	2.00	0.091	0.10	123
August.....	7.70	0.04	0.58	0.026	0.03	36
September.....	0.27	0.04	0.08	0.004	0.00	5
October.....	0.81	0.15	0.39	0.018	0.02	24
The period.....	.....	.....	.....	.....	1.49	1,765

SESSIONAL PAPER No. 25a

MEAN MONTHLY DISCHARGE in Second-feet of Hay creek at Hay Creek school

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		0.61	0.21	Nil	2.20	0.10	0.39	0.58	36
November		0.80 ^d	0.22 ^f						
December									
January						1.30 ^m			
February									
March	4.80 ^a			3.20 ^h	3.70 ^k	8.50		8.50	523
April	6.10	2.90 ^e	7.60	3.10	2.90	3.20		4.60	273
May	1.11	6.90	0.31	1.66	1.11	5.60		2.80	170
June	0.38	1.48	0.08	0.08	0.51	8.60		1.86	110
July	1.15 ^b		0.04	Nil	1.18	2.00		0.80	50
August	0.04 ^c	0.23	0.01	"	0.15	0.58		0.19	12
September	0.61	0.16	Nil	"	0.18	0.08		0.17	10
Total in acre-ft.	593	662	508	369	579	1,747			1,184

^a 24-31.^b 1-8.^c 14-31.^d 1-3.^e 16-30.^f 1-15.^h 20-31.^k 21-31.^m 27-29.

FAUQUIER DITCH FROM HAY CREEK

Location.—On SW. $\frac{1}{4}$ Sec. 29, Tp. 10, Rge. 25, W. 3rd Mer., about twenty feet down stream from the headgate.

Records available.—For irrigation season of 1915 and 1916.

Gauge.—Vertical staff; zero elevation maintained at 92.80 feet since March 29, 1915.

Bench-mark.—Permanent iron bench-mark located 300 feet east of the gauge and across Hay creek; assumed elevation 100.00 feet.

Channel.—One channel at all stages.

Discharge measurements.—Made with a weir.

Observer.—Miss M. Fauquier.

Remarks.—Ditch was used during 1916 from April 12 to April 30.

DISCHARGE MEASUREMENTS of Fauquier's ditch from Hay creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Fcet</i>	<i>Sec.-ft.</i>
April 27	E. J. Switzer				1.30	0.22 ^w
April 27	do				1.36	0.39 ^w
April 27	do				1.26	0.12 ^w
Aug. 26	do				Dry	Nil

^w Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Fauquier's ditch from Hay creek, for 1916

APRIL			APRIL			APRIL			APRIL		
Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>
12	1.80	2.60	16	1.55	1.20	21	1.36	0.39	26	1.35	0.36
13	1.63	1.66	17	1.50	0.95	22	1.33	0.30	27	1.35	0.36
14	1.45	0.73	18	1.45	0.73	23	1.26	0.12	28	1.34	0.33
15	1.55	1.20	19	1.40	0.53	24	1.35	0.36	29	1.32	0.28
			20	1.40	0.53	25	1.35	0.36	30	1.31	0.25

Total discharge for the period equals 26 acre-feet.

PEACOCK WEST DITCH FROM HAY CREEK

Location.—On SW. $\frac{1}{4}$ Sec. 33, Tp. 10, Rge. 26, W. 3rd Mer., about five miles southeast of Maple Creek, Saskatchewan.

Gauge.—Vertical staff situated on right bank of ditch about 55 feet below the headgate; zero elevation maintained at 98.50 feet since establishment.

Bench-mark.—On a wooden plug, used as initial point for soundings, situated on the right side of ditch, about four feet below the gauge; assumed elevation 100.00 feet.

Channel.—One channel with clay loam bed.

Discharge measurements.—Made with current-meter or weir.

Observer.—F. W. Peacock.

Remarks.—This station was established on May 19, 1915. No records were obtained in 1915 or 1916, but it is believed that some water was diverted by flooding directly from the creek above the intake to the ditches.

PEACOCK EAST DITCH FROM HAY CREEK

Location.—On SW. $\frac{1}{4}$ Sec. 36, Tp. 10, Rge. 26, W. 3rd Mer., five miles southeast of Maple Creek, Saskatchewan.

Gauge.—Vertical staff situated on the right bank of the ditch, about 100 feet below the intake; zero elevation maintained at 98.63 feet since establishment.

Bench-mark.—On a wooden plug used as the initial point for soundings on the right bank of ditch about five feet below the gauge; assumed elevation 100.00 feet.

Channel.—One channel with clay loam bed.

Discharge measurements.—Made by current-meter or weir.

Observer.—F. W. Peacock.

Remarks.—This station was established on May 19, 1915. No records were obtained in 1915 or 1916, but it is believed that some water was diverted by flooding directly from the creek above the intake to the ditches.

BIGSTICK LAKE DRAINAGE BASIN

General Description

Pigstick is one of the largest lakes in the northern Cypress Hills district. It is situated about Township 15, Range 25, West of the 3rd Meridian, and covers an area of 35 square miles. The lake is alkaline in character and has no outlet.

The only source of supply of the lake is Maple creek, which, with its tributary, Gap creek, rises in the Cypress hills, thirty-five miles south. On the south and east the lake is bounded by the Sand hills. The drainage area is 820 square miles.

The topography of the drainage basin is for the most part gently rolling and the creek slope is small except near the source. The basin is bare of trees except in the hills. The channel is flat, wide, and in most places sandy.

There are several small irrigation ditches in the basin.

SESSIONAL PAPER No. 25b

ADAMS NORTH DITCH NEAR CYPRESS P.O.

Location.—On the NE. $\frac{1}{4}$ Sec. 10, Tp. 9, Rge. 27, W. 3rd Mer., at Geo. A. Adam's ranch.

Records available.—For irrigation seasons of 1914-1915.

Gauge.—Vertical staff, located near the left bank and 50 feet below the headgate; elevation of zero 97.14 feet.

Bench-marks.—Top of wooden stake, about eight feet from gauge on the left bank; assumed elevation 100.00 feet.

Control.—A permanent 24-inch, sharp-crested weir, with complete end contractions, acts as a control. The crest of the weir is maintained at an elevation of 99.09 feet.

Channel.—Composed of a black sandy loam.

Discharge measurements.—Computed from the measured head over the 24-inch weir.

Observer.—Geo. A. Adams.

Remarks.—This station was visited May 16 and August 24, 1916, and no flow reported. It is understood, however, that a little water was used.

ADAMS SOUTH DITCH NEAR CYPRESS P.O.

Location.—On the NW. $\frac{1}{4}$ Sec. 10, Tp. 9, Rge. 27, W. 3rd Mer., at Geo. A. Adams' ranch.

Records available.—For the irrigation seasons of 1914-15-16.

Gauge.—Vertical staff located near the left bank about 100 feet below the headgate; elevation of zero 91.8 feet.

Bench-mark.—Permanent iron bench-mark located on the quarter-section line 200 feet south of the gauge and weir; assumed elevation 100.00 feet.

Control.—A permanent 24-inch, sharp-crested weir, with complete end contractions, is used as a control. The elevation of the crest was maintained at 93.18 feet during 1916.

Channel.—Composed of sandy loam.

Discharge measurements.—Computed from the measured head over the weir.

Observer.—Geo. A. Adams.

Remarks.—Ditch was used from April 4 to May 24, in 1916.

DISCHARGE MEASUREMENTS of Adams' South ditch near Cypress P.O., in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 26.....	E. J. Switzer.....	.....	.....	.....	1.78	0.42w
May 16.....	do.....	.....	.....	.....	1.77	0.38w
Aug. 24.....	do.....	.....	.....	.....	Dry	Nil

w Discharge determined by measured head of water over a 24-inch weir.

DAILY GAUGE HEIGHT AND DISCHARGE of Adams' South ditch near Cypress P.O., for 1916

APRIL			APRIL			MAY			MAY		
Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>
.....	.....	.....	16	1.85	0.72	1	1.79	0.46	16	1.77	0.38
.....	.....	.....	17	1.86	0.76	2	1.78	0.42	17	1.78	0.42
.....	.....	.....	18	1.85	0.72	3	1.80	0.50	18	1.77	0.38
4	1.75	0.31	19	1.76	0.34	4	1.82	0.58	19	1.77	0.38
5	1.75	0.31	20	1.78	0.42	5	1.81	0.54	20	1.77	0.38
6	1.74	0.27	21	1.80	0.50	6	1.81	0.54	21	1.76	0.34
7	1.75	0.31	22	1.79	0.46	7	1.79	0.46	22	1.75	0.31
8	1.78	0.42	23	1.76	0.34	8	1.78	0.42	23	1.81	0.54
9	1.87	0.81	24	1.78	0.42	9	1.78	0.42	24	1.80	0.50
10	1.90	0.96	25	1.79	0.46	10	1.78	0.42	.....	.....	.....
11	1.85	0.72	26	1.79	0.46	11	1.76	0.34	.....	.....	.....
12	1.85	0.72	27	1.79	0.46	12	1.76	0.34	.....	.....	.....
13	1.90	0.96	28	1.80	0.50	13	1.77	0.38	.....	.....	.....
14	1.85	0.72	29	1.80	0.50	14	1.77	0.38	.....	.....	.....
15	1.85	0.72	30	1.80	0.50	15	1.77	0.38	.....	.....	.....

MONTHLY DISCHARGE of Adams' South ditch near Cypress P.O., for 1916

MONTH	DISCHARGE IN SECOND-FEET			Total Discharge in Acre-feet
	Maximum	Minimum	Mean	
April (4-30).....	0.96	0.27	0.55	29
May (1-24).....	0.58	0.31	0.42	20
The period.....				49

GEORGE POLLOCK'S WEST DITCH FROM CYPRESS CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 17, Tp. 9, Rge. 27, W. 3rd Mer., about seven hundred feet below headgates.

Records available.—For the years 1914-16.

Gauge.—Vertical staff fastened to post driven into the bed of the ditch near the left bank; elevation of zero-96.61 feet.

Bench-mark.—On post; assumed elevation 100.00 feet.

Channel.—Composed of gravel.

Discharge measurements.—Made by measuring head over permanent weir.

Control.—A permanent sharp crested rectangular weir, ten feet below gauge rod, with thirty-six-inch crest, maintained at 97.25 feet.

Observer.—George Pollock.

Remarks.—Water used only from April 18 to May 31, in 1916, as shown by records below.

DISCHARGE MEASUREMENTS of Geo. Pollock's West ditch from Cypress creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 26.....	E. J. Switzer.....				0.87	1.09 ^w
May 16.....	do.....				0.84	0.88 ^w

^w Discharge determined by using a 36-inch permanent weir.

DAILY GAUGE HEIGHT AND DISCHARGE of Geo. Pollock's West ditch from Cypress creek, for 1916

APRIL			MAY			MAY			MAY		
DAY	Gauge Height	Discharge	DAY	Gauge Height	Discharge	DAY	Gauge Height	Discharge	DAY	Gauge Height	Discharge
	<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>
18	0.94	1.61	1	0.92	1.45	14	0.86	1.01	27	0.85	0.95
19	0.95	1.69	2	0.89	1.23	15	0.85	0.95	28	0.85	0.95
20	0.93	1.53	3	0.87	1.09	16	0.84	0.88	29	0.86	1.01
21	0.91	1.38	4	0.87	1.09	17	0.84	0.88	30	0.85	0.95
22	0.91 ^a	1.38	5	0.87	1.09	18	0.82	0.76	31	0.86	1.01
23	0.91	1.38	6	0.88	1.15	19	0.83	0.82			
24	0.91	1.38	7	0.88	1.15	20	0.80	0.63			
25	0.90	1.30	8	0.87	1.09	21	0.80	0.63			
26	0.87	1.09	9	0.85	0.95	22	0.91 ^a	0.68			
27	0.89	1.23	10	0.82	0.76	23	0.82 ^a	0.76			
28	0.96	1.77	11	0.85	0.95	24	0.83 ^a	0.82			
29	0.96	1.77	12	0.85	0.95	25	0.84 ^a	0.88			
30	0.95	1.69	13	0.85	0.95	26	0.85	0.95			

Discharge computed from head over 36-inch permanent weir.

Gauge height 0.64 is point of zero flow.

^a Gauge height interpolated.

SESSIONAL PAPER No. 25B

MONTHLY DISCHARGE of Geo. Pollock's West ditch from Cypress creek, for 1916

MONTH	DISCHARGE IN SECOND-FEET			Total Discharge in Acre-ft.
	Maximum	Minimum	Mean	
April (1-18).....	1.77	1.09	1.48	38
May.....	1.45	0.63	0.95	58
The period.....				96

GEORGE POLLOCK'S EAST DITCH FROM CYPRESS CREEK

Location.—On the SW. $\frac{1}{4}$ Sec. 17, Tp. 9, Rge. 27, W. 3rd. Mer., about fifty feet below headgate of ditch.

Gauge.—Vertical staff fastened to post driven into bed of ditch; zero maintained at 0.85 feet below crest of permanent weir.

Channel.—Composed of gumbo.

Discharge measurements.—Made by measuring head over permanent weir located ten feet below gauge.

Control.—Permanent sharp crested rectangular weir with thirty-six-inch crest.

Observer.—George Pollock.

Remarks.—This station was established May 19, 1914. No water was used during 1915. This station was visited on August 24, 1916, but there was no flow and it is believed that no water was diverted during 1916.

GAP CREEK AT SMALL'S RANCH

Location.—On the SE. $\frac{1}{4}$ Sec. 4, Tp. 10, Rge. 27, W. 3rd Mer., at Wm. Small's ranch.

Records available.—April 24, 1909, to October 31, 1916.

Gauge.—Vertical staff. The zero of the gauge was maintained at 66.53 feet during 1909-10; the zero of the gauge was maintained at 66.62 feet during 1911; the zero of the gauge was maintained at 66.63 feet during 1912-15; the zero of the gauge was maintained at 87.35 feet during 1916.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Composed of loose stones and gravel and liable to shift during flood stages.

Discharge measurements.—Made from cable car during high stages and by wading or with a weir during low stages.

Winter flow.—Station discontinued during winter season.

Observer.—A. Small.

DISCHARGE MEASUREMENTS of Gap creek at Small's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		Feet	Sq. ft.	Ft. per sec.	Feet	Sec.-ft.
Mar. 22.....	P. A. Fetterley.....	36.0	44.40	1.44	1.32	77.00
Mar. 28.....	E. J. Switzer.....	25.0	25.80	2.55	1.31	66.00
April 25.....	do.....	27.0	20.41	0.20	0.73	4.00
May 15.....	do.....	18.8	12.52	0.19	0.69	2.40
June 1.....	do.....	45.5	39.82	1.60	1.34	71.00
July 6.....	do.....	27.5	17.11	0.83	0.95	14.90
July 28.....	do.....	22.0	12.65	0.54	0.81	8.30
Aug. 23.....	do.....	13.5	6.10	0.14	0.61	0.86
Sept. 27.....	do.....	5.3	0.92	0.34	0.57	0.31

DAILY GAUGE HEIGHT AND DISCHARGE of Gap creek at Small's ranch, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.			1.01	20.0	0.77	5.70	1.34	72.0
2.			0.98	17.4	0.80	7.00	1.23	50.0
3.			0.95	14.9	0.79	6.60	1.12	32.0
4.			0.90	12.0	0.77	5.70	1.04	23.0
5.			0.88	11.0	0.78	6.10	1.35	74.0
6.			0.88	11.0	0.76	5.20	2.25	271.0
7.			0.85	9.4	0.76	5.20	1.42	88.0
8.	1.46 ^b	97.0	0.85	9.4	0.72	3.80	1.14	35.0
9.	1.52	110.0	1.00	19.1	0.70	3.20	1.04	23.0
10.	1.72	154.0	1.13	34.0	0.72	3.80	1.15	37.0
11.	2.53	333.0	1.12	32.0	0.69	2.90	3.21	482.0
12.	1.98	212.0	1.10	30.0	0.69	2.90	2.20	260.0
13.	1.41	86.0	1.04	23.0	0.69	2.90	1.39	82.0
14.	1.28	59.0	1.05	24.0	0.68	2.70	1.21	46.0
15.	1.18 ^b	41.0	1.08	27.0	0.69	2.90	1.14	35.0
16.	1.13	34.0	1.01	20.0	0.70	3.20	1.05	24.0
17.	1.11	31.0	0.88	11.0	0.74	4.50	0.99	18.3
18.	1.08	27.0	0.85	9.4	0.72	3.80	0.94	14.3
19.	0.98	17.4	0.87	10.4	0.69	2.90	0.86	9.9
20.	1.38	80.0	0.85	9.4	0.67	2.40	0.84	8.9
21.	1.96	207.0	0.82	8.0	0.65	1.90	0.80	7.0
22.	1.32	68.0	0.80	7.0	0.64	1.68	0.87	10.4
23.	1.37	78.0	0.77	5.7	0.68	2.70	1.84	181.0
24.	1.04	23.0	0.75	4.8	0.78	6.10	1.26	55.0
25.	1.04	23.0	0.73	4.2	1.10	30.00	1.07	26.0
26.	0.95	14.9	0.69	2.9	1.35	74.00	0.97	16.6
27.	1.39	82.0	0.68	2.7	2.17	253.00	0.91	12.6
28.	1.31	65.0	0.71	3.5	2.38	300.00	0.90	12.0
29.	1.09	28.0	0.75	4.8	2.44	313.00	0.88	11.0
30.	0.90	12.0	0.77	5.7	2.59	346.00	1.73	157.0
31.	0.94	14.3			1.66	141.00		

^b Ice conditions; thin ice over creek does not affect the discharge.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Gap creek at Small's ranch, for 1916.—*Concluded.*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1	1 25	53.0	0 63	1 46	0 56	0 40	0 59	0 70
2	1 02	21 0	0 60	0 80	0 54	0 24	0 59	0 70
3	1 05	24 0	0 59	0 70	0 54	0 24	0 64	1 68
4	1 32	68 0	0 57	0 50	0 57	0 50	0 71	3 50
5	1 06	25 0	0 55	0 30	0 57	0 50	0 71	3 50
6	0 95	14 9	0 58	0 60	0 57	0 50	0 82	8 00
7	0 90	12 0	0 56	0 40	0 57	0 50	0 87	10 40
8	1 42	88 0	0 55	0 30	0 57	0 50	0 85	9 40
9	1 25	53 0	0 65	2 20	0 57	0 50	0 82	8 00
10	1 10	30 0	1 11	31 00	0 57	0 50	0 77	5 70
11	1 00	19 1	0 86	9 90	0 55	0 30	0 77	5 70
12	0 95	14 9	0 81	7 50	0 55	0 30	0 82	8 00
13	0 90	12 0	0 76	5 20	0 54	0 24	0 82	8 00
14	0 84	8 9	0 71	3 50	0 54	0 24	0 81	7 50
15	0 84	8 9	0 65	1 90	0 54	0 24	0 79	6 60
16	0 78	6 1	0 64	1 68	0 54	0 24	0 77	5 70
17	0 82	8 0	0 62	1 24	0 54	0 24	0 75	4 80
18	0 83	8 4	0 77	5 70	0 54	0 24	0 73	4 20
19	0 88	11 0	0 68	2 70	0 54	0 24	0 72	3 80
20	0 84	8 9	0 67	2 40	0 54	0 24	0 72	3 80
21	0 76	5 2	0 65	1 90	0 54	0 24	0 71	3 50
22	0 71	3 5	0 64	1 68	0 53	0 18	0 70	3 20
23	0 71	3 5	0 61	1 02	0 53	0 18	0 71	3 50
24	0 69	2 9	0 60	0 80	0 53	0 18	0 71	3 50
25	0 66	2 2	0 58	0 60	0 53	0 18	0 72	3 80
26	0 67	2 4	0 58	0 60	0 53	0 18	0 72	3 80
27	0 80	7 0	0 57	0 50	0 57	0 50	0 72	3 80
28	0 81	7 5	0 57	0 50	0 56	0 40	0 72	3 80
29	0 77	5 7	0 57	0 50	0 55	0 30	0 72	3 80
30	0 72	3 8	0 57	0 50	0 61	1 02	0 71	3 50
31	0 67	2 4	0 57	0 50	.....	.....	0 71	3 50

MONTHLY DISCHARGE of Gap creek at Small's ranch, for 1916

(Drainage area 108 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (8-31)	333.00	12.00	79.00	0.731	0.65	3,760
April	34.00	2.70	13.50	0.125	0.14	803
May	346.00	1.68	50.00	0.463	0.53	3,074
June	482.00	7.00	72.00	0.667	0.74	4,284
July	88.00	2.20	17.50	0.162	0.19	1,076
August	31.00	0.30	2.90	0.027	0.03	178
September	1.02	0.18	0.34	0.003	0.00	20
October	10.40	0.70	4.80	0.044	0.05	295
The period		.....			2 33	13,490

MEAN MONTHLY DISCHARGE in Second-feet of Gap creek at Small's ranch

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.		0.01	Nil	4.40	0.08	Nil	21.00	1.35	4.8	3.96	245
Nov.				3.30 ^d	0.41 ^f						
Dec.											
January											
Feb.											
March			57.00 ^c			57.00 ^h	266.00 ^k	79.00 ^m			
April.	58.00 ^a	0.52	39.00	88.00 ^e	79.00 ^g	42.00	71.00	13.50		33.00	1,974
May.	52.00	0.16	12.30	15.30	3.40	3.70	8.90	50.00		18.20	1,120
June.	30.00 ^b	0.01	4.40	2.90	0.70	0.03	72.00	72.00		22.00	1,293
July.	7.10	Nil	6.80	Nil	0.58	Nil	19.90	17.50		6.50	399
August.	0.71	"	0.80	0.09	0.00	"	5.00	2.90		1.19	73
Sept.	0.00	"	45.00	"	"	1.65	0.07	0.34		5.90	401
Total in Acre-ft.	6,139	43	7,591	6,191	4,743	5,797	19,291	13,278			5,505

^a 24-30.^b 1-19 and 22-30.^c 22-31.^d 1-15.^e 4-30.^f 1-15.^g 3-30.^h 6-31.^k 18-31.^m 8-31.

WM. SMALL DITCH FROM MCSHANE CREEK

Location.—On the SE. $\frac{1}{4}$ Sec. 22, Tp. 9, Rge. 27, W. 3rd Mer., 1,500 feet below headgate.*Records available.*—From April 15, 1916, to July 4, 1916.*Gauge.*—Vertical staff, driven into the bed of the ditch near the left bank. Zero maintained at elevation 95.92 feet since establishment.*Bench-mark.*—Permanent iron bench-mark, located on the left bank, five feet below the gauge and two feet from edge of ditch; assumed elevation 100.00 feet.*Channel.*—Composed of gravel and sand, slightly shifting.*Discharge measurements.*—Made by wading with current-meter or with weir.*Observer.*—Wm. Small.*Remarks.*—Ditch was used from April 15 to May 30, and from June 20 to July 4, in 1916.

DISCHARGE MEASUREMENTS of Wm. Small ditch from McShane creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 26.	E. J. Switzer	5.0	1.80	1.04	0.65	1.87
April 26.	do				0.50	0.91 ^w
April 26.	do				0.44	0.62 ^w
May 16.	do	4.8	1.67	0.69	0.63	1.14
Aug. 24.	do				Dry	Nil

^w Discharge determined by using an 18-inch weir.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Wm. Small ditch from McShane creek, for 1916

DAY	April		May		June		July	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....				1.55e			0.80	3.10
2.....			0.60	1.52				4.10e
3.....				1.52e				5.00e
4.....			0.60	1.52			1.10h	6.00
5.....				1.49e				
6.....			0.59	1.46				
7.....			0.59	1.46				
8.....				1.44e				
9.....				1.42e				
10.....			0.58	1.39				
11.....			0.55	1.20				
12.....				1.14e				
13.....			0.53	1.08				
14.....			0.53	1.08				
15.....	0.94h	4.40		1.00e				
16.....		4.50e		0.93e				
17.....		4.60e	0.49	0.86				
18.....	0.98	4.80		0.86e				
19.....		4.30e	0.49	0.86				
20.....		3.80e		0.84e	0.67h	2.00		
21.....		3.40e	0.48	0.82		2.30e		
22.....	0.78	2.90		2.10e	0.75	2.60		
23.....		2.60e		3.30e		2.90e		
24.....		2.20e		4.60e		3.20e		
25.....		1.92e		5.80e	0.84	3.40		
26.....	0.61	1.59		7.10e		3.40e		
27.....		1.59e		8.30e		3.30e		
28.....	0.61	1.59		9.60e		3.30e		
29.....		1.59e		10.80e		3.20e		
30.....	0.61	1.59	1.68h	12.00		3.10e		
31.....								

e Discharge estimated.

h Headgate opened on April 15, closed on May 30; opened on June 20 and closed for season on July 4.

MONTHLY DISCHARGE of Wm. Small ditch from McShane creek, for 1916

MONTH	DISCHARGE IN SECOND-FEET			Total Discharge in Acre-ft.
	Maximum	Minimum	Mean	
April (15-30).....	4.8	1.59	3.0	95
May (1-30).....	12.0	0.82	3.0	178
June (20-30).....	3.4	2.00	3.0	65
July (1-4).....	6.0	3.10	4.6	36
The period.....				374

MAPLE CREEK NEAR MAPLE CREEK

Location.—On the SE. ¼ Sec. 28, Tp. 11, Rge. 26, W. 3rd Mer.*Records available.*—May 4, 1910, to October 31, 1916.*Gauge.*—Vertical staff; zero of gauge was maintained at 81.64 feet during 1910-11; 81.60 feet during 1912-15 and 83.60 feet since September 17, 1915.*Bench-mark.*—Permanent iron bench-mark; assumed elevation 100.00 feet.*Channel.*—Composed of sand, and liable to shift during floods.

Discharge measurements.—Made from bridge by wading, or with weir, according to stage.

Artificial control.—On May 28, 1915, a control was built fifty feet below the gauge at this station, consisting of timbers jointed so as to form a V notch weir faced in the upstream side with board piling, and securely anchored to the bed of the stream and banks by posts.

Winter flow.—Station discontinued during the winter season.

Observer.—Miss Kate Williams.

DISCHARGE MEASUREMENTS of Maple creek near Maple Creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq ft</i>	<i>Ft per sec</i>	<i>Feet</i>	<i>Sec-ft</i>
Mar. 20	P A Fetterley	9.5	9.43	1.80	1.94	17.00
April 1	E J Switzer	24.5	18.23	0.75	1.82	13.70
April 25	do	22.0	9.68	0.49	1.51	4.70
May 17	do	20.8	8.72	0.28	1.42	2.40
May 30	do	44.4	113.62	0.88	3.54	100.00
June 14	R J McGuinness	40.6	78.79	0.78	2.80	62.00
June 19	E J Switzer	23.5	17.16	0.59	1.53	10.30
July 15	do				0.45	0.57 ^w
July 27	do				0.48	0.57 ^w
Aug. 10	do	11.1	4.32	1.09	0.88	4.70
Sept. 28	do	5.0	1.35	0.36	0.45	0.48
Nov. 3	do	4.8	1.09	0.86	0.46	0.94

^w Discharge determined by using an 18-inch weir.

DAILY GAUGE HEIGHT AND DISCHARGE of Maple creek near Maple Creek, for 1916

DAY	March		April		May		June	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1			1.82	13.4	1.53	5.4	2.34	32.0
2				13.7 ^e	1.53	5.4	2.34	32.0
3			1.84	14.0	1.53	5.4	2.29	30.0
4			1.74	11.0	1.43	2.9	2.29	30.0
5			1.71	10.2	1.43	2.9	2.29	30.0
6			1.65	8.5	1.47	3.9	5.15	207.0
7			1.64	8.2	1.47	3.9	4.33	153.0
8			1.63	8.0	1.47	3.9	2.85	57.0
9	3.31 ^b	22.0	1.74	11.0	1.47	3.9	2.34	32.0
10	4.01	35.0	1.86	14.6	1.47	3.9		100.0 ^e
11	4.62	45.0	1.95	17.5	1.47	3.9		168.0 ^e
12	4.50	42.0	2.12	23.0	1.47	3.9	5.59	236.0
13	4.21	37.0	2.12	23.0	1.47	3.9	4.19	144.0
14	3.01 ^b	20.0	2.09	22.0	1.44	3.2	2.80	62.0
15	2.21	27.0		19.7 ^e	1.44	3.2	2.24	34.0
16	2.41	35.0	1.95	17.5	1.44	3.2	2.09	28.0
17	2.07	22.0	1.84	14.0	1.42	2.7	1.94	22.0
18	1.91	16.2	1.72	10.5	1.44	3.2	1.53	10.4
19	2.10	23.0	1.72	10.5	1.44	3.2	1.53	10.4
20	1.94	17.2	1.75	11.3	1.44	3.2	1.27	5.8
21		18.0 ^e	1.73	10.7	1.43	2.9	1.27	5.8
22		18.8 ^e	1.73	10.7	1.43	2.9		7.2 ^e
23	2.01	19.5		8.7 ^e	1.43	2.9	1.44	8.5
24	2.02	19.9		6.8 ^e		12.3 ^e	1.44	8.5
25	2.05	21.0	1.51	4.9		22.0 ^e	1.44	8.5
26	2.05	21.0	1.52	5.1	2.32	31.0	2.15	30.0
27	2.13	24.0	1.52	5.1	1.52	5.1	1.75	15.9
28	2.23	28.0	1.52	5.1	1.52	5.1	1.75	15.9
29	2.34	32.0	1.53	5.4		41.0 ^e	1.75	15.9
30	2.04	21.0	1.53	5.4	3.54	101.0	1.75	15.9
31	1.84	14.0			3.50	98.0		

^{b-b} Ice conditions from Mar. 9 to 14; discharge estimated.

^e Discharge estimated.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Maple creek near Maple Creek, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec -ft</i>	<i>Feet</i>	<i>Sec -ft</i>	<i>Feet</i>	<i>Sec -ft</i>	<i>Feet</i>	<i>Sec -ft</i>
1.....	1.74	15.60	0.61	0.88	0.40	0.44	0.45	0.52
2.....		14.40 ^e	0.61	0.88	0.40	0.44		0.68 ^e
3.....		13.20 ^e	0.61	0.88	0.40	0.44		0.84 ^e
4.....	1.60	12.00	0.61	0.88	0.40	0.44		1.01 ^e
5.....	1.34	6.80	0.61	0.88	0.40	0.44	0.70	1.18
6.....	1.29	6.10	0.60	0.85	0.40	0.44	0.72	1.27
7.....	1.29	6.10	0.60	0.85	0.40	0.44	0.69	1.14
8.....	1.04	3.30	0.60	0.85	0.40	0.44	0.52	0.65
9.....	1.04	3.30	0.60	0.85	0.40	0.44	0.50	0.61
10.....	1.04	3.30	0.88	2.10	0.40	0.44	0.47	0.56
11.....	1.04	3.30	0.60	0.85	0.40	0.44	0.41	0.46
12.....	1.04	3.30	0.60	0.85	0.40	0.44	0.41	0.46
13.....	1.04	3.30	0.60	0.85	0.40	0.44	0.41	0.46
14.....		1.91 ^e	0.60	0.85	0.39	0.43	0.41	0.46
15.....	0.45	0.52	0.60	0.85	0.39	0.43	0.41	0.46
16.....	0.45	0.52	0.60	0.85	0.39	0.43	0.41	0.46
17.....	0.45	0.52		0.85 ^e	0.40	0.44	0.40	0.44
18.....	0.52	0.65	0.60	0.85	0.40	0.44	0.40	0.44
19.....	0.55	0.72	0.60	0.85	0.40	0.44	0.40	0.44
20.....	0.55	0.72	0.60	0.85	0.40	0.44	0.40	0.44
21.....	0.56	0.75	0.60	0.85	0.40	0.44	0.40	0.44
22.....	0.56	0.75	0.52	0.65	0.40	0.44	0.40	0.44
23.....	0.56	0.75	0.52	0.65	0.40	0.44	0.40	0.44
24.....	0.49	0.59	0.50	0.61	0.40	0.44	0.40	0.44
25.....	0.45	0.52	0.45	0.52	0.40	0.44	0.40	0.44
26.....	0.42	0.47	0.45	0.52	0.40	0.44	0.40	0.44
27.....	0.48	0.57	0.45	0.52		0.48 ^e	0.40	0.44
28.....	0.50	0.61	0.45	0.52	0.45	0.52	0.40	0.44
29.....		0.76 ^e	0.45	0.52	0.45	0.52	0.40	0.44
30.....	0.62	0.91	0.43	0.49	0.45	0.52	0.40	0.44
31.....	0.62	0.91	0.41	0.46			0.40	0.44

^e Discharge estimated.

MONTHLY DISCHARGE of Maple creek near Maple Creek, for 1916

(Drainage area 82 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March (9-31).....	45.00	14.00	25.00	0.305	0.26	1,140
April.....	23.00	4.90	11.60	0.141	0.16	690
May.....	101.00	2.70	12.90	0.157	0.18	793
June.....	236.00	5.80	52.00	0.634	0.71	3,094
July.....	15.60	0.47	3.40	0.041	0.05	209
August.....	2.10	0.46	0.80	0.010	0.01	49
September.....	0.52	0.43	0.45	0.005	0.01	27
October.....	1.27	0.44	0.56	0.007	0.01	34
The period.....					1.39	6,036

MEAN MONTHLY DISCHARGE in Second-feet of Maple creek near Maple Creek

MONTH	1908-9	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		0.03	Nil	1.20	0.15	Nil	16.30	0.36	0.56	2.30	143
November.....				1.00 _f	0.14 _g						
December.....											
January.....											
February.....											
March.....	8.50 _a		52.00 _c			38.00 _h	86.00 _k	25.00 _m			
April.....	35.00	0.99	45.00	79.00	53.00	20.00	25.00	11.60		33.00	1,944
May.....	38.00	0.18	8.70	16.80	4.00	2.60	2.10	12.90		10.70	657
June.....	29.00 _b	0.13	5.60 _d	11.50	0.54	0.20	8.30	52.00		12.10	721
July.....	13.80	0.03	Nil _e	0.53	0.42	0.21	17.90	3.40		5.20	319
August.....	0.12	0.02	Nil	3.30	0.12	1.25	0.29	0.80		0.74	45
September.....	0.03	0.01	0.90	0.19	0.09	0.84	0.55	0.45		0.38	23
Total in acre-ft....	6,955	84	4,467	6,196	3,492	2,963	6,145	6,024			3,852

a 29-31.*b* 1-19; 22-30.*c* 23-31.*d* 1-23.*e* 27-31.*f* 1-4.*g* 1-15.*h* 13-31.*k* 21-31.*m* 9-31.

Prior to 1912 records taken at Maple creek (16-11-16-3), drainage area 81 square miles.

MAPLE CREEK AT DIXON'S RANCH

Location.—On the NE. $\frac{1}{4}$ Sec. 5, Tp. 12, Rge. 26, W. 3rd Mer., at Joseph Dixon's ranch, four miles north and one mile west of the town of Maple Creek.

Records available.—May 1 to October 31, 1916.

Gauge.—Vertical staff nailed to a 4-inch by 4-inch post driven into the bed of the stream near the right bank and braced by two pieces 2 inches by 4 inches to the right bank, 150 feet up stream from the natural rock control and trail crossing. Zero elevation maintained at 89.92 feet since establishment.

Bench-mark.—Permanent iron bench-mark forty feet west of gauge; assumed elevation 100.00 feet.

Channel.—Practically permanent and with channel at all stages composed of clay and rock.

Discharge measurements.—Made by wading or from highway bridge three-quarters mile up stream during flood stage.

Winter flow.—Station discontinued during winter season.

Observer.—Miss Agnes Dixon.

DISCHARGE MEASUREMENTS of Maple creek at Dixon's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 21.....	E. J. Switzer.....	43.0	128.00	2.59	3.75	333.00
April 1.....	do.....	37.0	40.69	0.98	2.50	40.00
April 24.....	do.....	18.0	23.75	0.72	2.10	17.20
May 17.....	do.....	17.9	19.34	0.39	1.88	7.60
May 30.....	do.....	48.3	163.46	2.61	4.32	426.00
June 14.....	R. J. McGuinness.....	35.3	90.93	2.20	3.41	200.00
June 19.....	E. J. Switzer.....	18.3	30.62	1.25	2.41	38.00
July 15.....	do.....	18.5	21.53	0.40	2.01	8.60
July 26.....	do.....	18.5	19.35	0.36	1.84	7.00
Aug. 15.....	do.....	18.2	20.28	0.36	1.88	7.30
Sept. 28.....	do.....	6.0	3.10	0.48	1.61	1.50
Nov. 3.....	do.....	7.8	3.94	1.86	1.81	7.20

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Maple creek at Dixon's ranch, for 1916

DAY	March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	3.80b	40	2.50	43.0	2.03	12.9	4.54	559
2.....	3.34	35	2.48	41.0	2.02	12.5	.....	328e
3.....	3.00	30	2.45	38.0	2.01	12.2	2.92	97
4.....	2.82	25	.....	33.0e	.....	12.2e	2.84	85
5.....	2.71	20	2.34	29.0	2.01	12.2	2.72	68
6.....	2.69	20	.....	34.0e	2.01	12.2	4.82	662
7.....	2.65b	75	.....	39.0e	2.01	12.2	3.84	318
8.....	2.97	106	.....	44.0e	1.96	10.4	3.11	132
9.....	3.70	275	.....	48.0e	1.94	9.7	2.65	59
10.....	.....f	808e	.....	52.0e	1.89	8.1	2.72	68
11.....	.....	700e	2.62	56.0	1.87	7.6	3.91	340
12.....	.....	600e	2.65	59.0	.....	7.1e	7.21	1,612
13.....	.....	500e	2.60	54.0	1.84	6.7	4.11	407
14.....	.....	400e	2.55	48.0	1.83	6.4	3.41	199
15.....	.....	250e	2.56	49.0	1.82	6.2	2.98	107
16.....	.....	100e	2.58	51.0	.....	7.0e	2.69	64
17.....	.....	80e	2.51	44.0	1.88	7.8	2.66	60
18.....	.....	65e	.....	33.0e	1.87	7.6	2.68	63
19.....	2.65f	59	2.22	22.0	1.90	8.4	2.41	35
20.....	2.64	58	2.21	21.0	1.86	7.3	2.50	43
21.....	3.75	290	2.20	20.0	.....	7.0e	2.31	27
22.....	3.99	367	2.15	17.8	1.84	6.7	2.29	26
23.....	3.35	185	2.11	16.0	1.83	6.4	3.25	162
24.....	.....	130e	2.10	15.6	1.84	6.7	3.75	290
25.....	2.78	76	2.12	16.5	1.92	9.0	2.63	57
26.....	2.80	79	2.05	13.6	2.83	83.0	2.70	65
27.....	2.72	68	1.97	10.7	3.82	311.0	2.69	64
28.....	3.15	140	1.96	10.4	4.72	624.0	2.41	35
29.....	.....	106e	1.97	10.7	4.52	552.0	2.29	26
30.....	2.75	72	2.02	12.5	4.32	480.0	3.25	162
31.....	2.64	58	.....	.....	4.55	563.0	.....	.....

b-b Ice conditions; discharge estimated.

e Discharge estimated.

Gauge washed out March 10; re-installed March 19.

DAILY GAUGE HEIGHT AND DISCHARGE of Maple creek at Dixon's ranch, for 1916.—*Concluded.*

Day	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	3.85	321.0	1.87	7.60	1.60	1.30	1.54	0.72
2.....	2.82	82.0	1.86	7.30	1.58	1.10	1.58	1.10
3.....	2.52	45.0	1.85	7.00	1.57	1.00	.....	2.00e
4.....	2.66	60.0	1.79	5.30	1.61	1.48	1.69	3.00
5.....	2.80	79.0	1.70	3.20	1.63	1.84	1.76	4.60
6.....	2.74	71.0	1.68	2.80	1.62	1.66	.....	5.60e
7.....	2.42	36.0	1.66	2.40	1.57	1.00	1.84	6.70
8.....	2.30	26.0	1.65	2.20	1.57	1.00	1.88	7.80
9.....	2.41	35.0	2.11	16.00	1.56	0.90	2.01	12.20
10.....	2.50	43.0	2.23	22.00	1.48	0.32	1.92	9.00
11.....	2.39	33.0	2.52	45.00	1.54	0.72	1.87	7.60
12.....	2.30	26.0	2.21	21.00	1.53	0.64	1.85	7.00
13.....	2.22	21.0	2.02	12.50	1.52	0.56	1.81	5.90
14.....	2.01	12.2	1.87	7.60	1.52	0.56	1.87	7.60
15.....	2.00	11.8	1.88	7.80	1.52	0.56	1.87	7.60
16.....	1.96	10.4	1.81	5.90	1.53	0.64	1.87	7.60
17.....	1.94	9.7	1.87	7.60	1.54	0.72	1.86	7.30
18.....	1.92	9.0	1.84	6.70	1.52	0.56	1.84	6.70
19.....	1.90	8.4	1.82	6.20	.....	0.52e	1.80	5.60
20.....	1.87	7.6	1.76	4.60	1.51	0.48	1.83	6.40
21.....	1.90	8.4	1.74	4.10	.....	0.48e	1.81	5.90
22.....	1.82	6.2	1.72	3.60	1.51	0.48	1.79	5.30
23.....	1.80	5.6	1.71	3.40	1.50	0.40	1.77	4.80
24.....	1.79	5.3	1.70	3.20	1.51	0.48	1.78	5.10
25.....	1.79	5.3	1.69	3.00	1.51	0.48	1.82	6.20
26.....	1.84	6.7	1.68	2.80	1.51	0.48	.....	6.00e
27.....	1.87	7.6	1.67	2.60	1.51	0.48	1.81	5.90
28.....	1.89	8.1	1.66	2.40	1.61	1.48	1.83	6.40
29.....	1.92	9.0	1.64	2.00	.....	1.15e	1.85	7.00
30.....	1.90	8.4	1.62	1.66	1.57	1.00	1.87	7.60
31.....	1.88	7.8	1.61	1.48	.....	.....	1.85	7.00

e Discharge estimated.

MONTHLY DISCHARGE of Maple creek at Dixon's ranch, for 1916

(Drainage area 375 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
March.....	808.00	20.00	192.00	0.512	0.59	11,806
April.....	59.00	10.40	33.00	0.089	0.10	1,964
May.....	624.00	6.20	92.00	0.245	0.28	5,657
June.....	1,612.00	26.00	207.00	0.552	0.62	12,317
July.....	321.00	5.30	33.00	0.089	0.10	2,029
August.....	45.00	1.48	7.40	0.020	0.02	455
September.....	1.84	0.32	0.82	0.002	0.00	49
October.....	12.20	0.72	6.10	0.016	0.02	375
The period.....	.....	.....	.....	.....	1.73	34,652

SESSIONAL PAPER No. 25B

DIXON DITCH FROM MAPLE CREEK

Location.—On the SE. $\frac{1}{4}$ Sec. 17, Tp. 12, Rge. 26, W. 3rd Mer.

Records available.—Incomplete data for 1915-16.

Gauge.—Vertical staff situated at the headgate; zero maintained at elevation 95.88 feet since establishment to April 2, 1916, when it was changed to 95.13 feet.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—One channel, clay bed.

Discharge measurements.—Made with current-meter or weir.

Observer.—Joseph Dixon.

Remarks.—This station was established on June 4, 1911. Records show that water was used in irrigation season of 1915 and 1916, but no data was obtained during 1915 and not sufficient discharge measurements obtained in 1916 to plot a discharge curve. Water was used for twenty-eight days between April 2 and May 6, 1916. Estimated average discharge, 4.0 second-feet.

DISCHARGE MEASUREMENTS of Dixon ditch from Maple creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 24.....	E. J. Switzer.....	11.2	5.33	0.71	1.00	3.8
Aug. 15.....	do.....				Dry	Nil

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Bigstick lake drainage basin, in 1916

Date	Engineer	Stream	Location	Width	Area of Section	Mean Velocity	Discharge
				<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
May 17	E. J. Switzer.....	Gap creek.....	NE. 28-11-26-3	10.3	6.51	0.55	3.60
May 30	do.....	do.....	SE. 30-11-26-3	47.0	205.00	1.96	403.00
June 14	R. J. McGuinness	do.....	do.....	47.5	113.00	1.21	136.00
June 19	E. J. Switzer.....	do.....	NE. 28-11-26-3	15.9	22.00	1.01	22.00
July 15	do.....	do.....	do.....	12.4	7.88	0.95	7.50
July 27	do.....	do.....	do.....	7.4	5.32	0.73	3.90
Aug. 10	do.....	do.....	do.....	11.2	13.90	0.92	12.80
Mar. 22	P. A. Fetterley....	McShane creek...	SE. 4-10-27-3	5.6	9.10	1.43	13.00
April 25	E. J. Switzer.....	do.....	do.....				0.65w
May 16	do.....	do.....	do.....				0.08w
June 1	do.....	do.....	do.....	16.0	10.10	0.69	7.00
July 6	do.....	do.....	do.....	5.2	1.40	0.47	0.67
July 28	do.....	do.....	do.....	5.5	2.50	0.60	1.51
Aug. 23	do.....	do.....	do.....				Nil

w Discharge determined by using an 18-inch weir.

MANY ISLAND LAKE DRAINAGE BASIN

General Description

Many Island lake is about twenty-five square miles in area, and is situated on the boundary line between the provinces of Alberta and Saskatchewan, about ten miles north of the town of Walsh. It is the farthest west of the several lakes which receive the drainage of the northern slope of the Cypress hills. The lake is shallow and alkaline. Its only source of water supply is Mackay creek with its tributaries, Stony and Boxelder creeks.

The topography of the basin is very rough and the creek slopes are heavy. The basin is bare of trees except in the hills near the sources of the streams. The creek channels are deep and the beds are mostly gravel.

As is the case in all prairie basins the highest discharges occur in April. Usually all the streams of this drainage basin stop running in June or July and generally remain so for the remainder of the season.

In the lower part of the drainage basin near the lake, irrigation has been developed to some extent in hay meadows. In the upper part there are few irrigation schemes.

MACKAY CREEK AT WALSH

Location.—On NW. $\frac{1}{4}$ Sec. 26, Tp. 11, Rge. 1, W. 4th Mer., at traffic bridge.

Records available.—July 29, 1909, to October 31, 1916.

Gauge.—Vertical staff; elevation 2,432.65 feet above sea-level, maintained since establishment.

Bench-mark.—Permanent iron bench-mark; elevation 2,443.73 feet above mean sea-level (Geodetic Survey of Canada.)

Channel.—Composed of clay.

Discharge measurements.—Made from bridge, wading or with a weir.

Floods.—On June 13, 1916, this stream overflowed its banks at the town of Walsh and caused considerable damage. This rise was due to excessive rainfall at the headwaters.

Winter flow.—Station not maintained during winter.

Observer.—Edward Sept.

DISCHARGE MEASUREMENTS of Mackay creek at Walsh, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 3.....	E. J. Switzer.....	12.5	13.52	0.96	1.18	13.00 _n
April 19.....	do.....	12.0	9.83	0.89	1.05	8.80 _n
May 18.....	do.....	14.0	22.12	0.22	0.89	5.00
May 29.....	do.....	57.2	173.96	1.26	4.67	219.00
June 13.....	R. J. McGuinness.....	59.5	222.75	1.37	5.39	306.00
June 13.....	do.....	63.5	580.95	3.16	11.34	1,836.00 _n
June 20.....	do.....	15.0	35.44	0.71	1.62	25.00
June 29.....	E. J. Switzer.....	16.0	39.65	0.67	1.72	27.00
July 17.....	do.....	10.8	7.34	0.41	0.56	3.10 _n
July 25.....	do.....	11.7	7.82	0.40	0.61	3.10 _n
Aug. 16.....	do.....	11.8	9.35	0.58	0.73	5.00 _n
Aug. 22.....	do.....	12.3	9.82	0.59	0.77	6.00 _n
Sept. 26.....	do.....	11.2	4.97	0.15	0.32	0.75 _n
Nov. 2.....	do.....	9.8	4.66	0.98	0.67	4.60 _n

_n Discharge measured at miscellaneous sections.

_x Slope measurement.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Mackay creek at Walsh, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			1.28	14.60	0.24	0.66	0.87	6.4	3.99	153
2.....			0.88	6.50	0.24	0.66	0.88	6.5	3.45	111
3.....			1.14	11.00	1.18 ^f	12.00	1.04	8.9	2.99	83
4.....			1.22	13.00	1.16	11.50	1.00	8.3	2.46	56
5.....			1.33	15.90	1.09	9.90	1.00	8.3	2.65	65
6.....			1.46	19.70	1.06	9.30	0.93	7.2	7.78	807
7.....			1.56	23.00	1.04	8.90	0.93	7.2	4.61	213
8.....			1.15	11.20	1.00	8.30	0.86	6.2	3.03	85
9.....			2.65	65.00	1.04	8.90	0.88	6.5	2.43	54
10.....			2.80	72.00	1.16	11.50	0.80	5.5	2.55	60
11.....			6.51	507.00	1.31	15.40	0.76	5.0	10.00	1,447
12.....			5.41	312.00	1.36	16.80	0.74	4.8	9.74	1,372
13.....			3.98	152.00	1.34	16.20	0.74	4.8	5.11	270
14.....			2.65	65.00	1.23	13.30	0.75	4.9	3.58	120
15.....			1.89	33.00	1.26	14.10	0.76	5.0	2.98	82
16.....			0.98	8.00	1.27	14.30	0.81	5.6	2.61	63
17.....			1.08	9.70	1.18	12.00	0.81	5.6	2.28	48
18.....			1.62	24.00	1.12	10.50	0.89	6.7	2.04	38
19.....			1.21	12.80	1.05	9.10	0.82	5.7	1.72	28
20.....			1.46	19.70	1.02	8.60	0.78	5.3	1.62	24
21.....	3.30	102.0	2.04	38.00	0.98	8.00	0.70	4.3	1.50	21
22.....	2.70	68.0	1.72	28.00	0.94	7.40	0.69	4.2	1.58	23
23.....	2.72	68.0	1.31	15.40	0.89	6.70	0.82	5.7	3.61	123
24.....	1.88	33.0	0.81	5.60	0.84	6.00	0.87	6.4	3.45	111
25.....	1.80	30.0	0.71	4.40	0.80	5.50	1.68	26.0	2.54	60
26.....	1.65	25.0	0.58	3.10	0.77	5.10	2.91	78.0	2.10	41
27.....	1.53	22.0	0.60	3.30	0.77	5.10	5.68	354.0	1.98	36
28.....	1.40	17.9	0.88	6.50	0.77	5.10	5.09	268.0	1.92	34
29.....	1.44	19.1	0.81	5.60	0.89	6.70	4.67	220.0	1.72	28
30.....			0.53	2.60	0.89	6.70	8.60	1,041.0	2.84	75
31.....			0.32	1.12	.....	.....	6.19	444.0	.....	.....

^f Gauge replaced.

DAILY GAUGE HEIGHT AND DISCHARGE of Mackay creek at Walsh, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	2.77	71.0	0.75	4.90	0.47	2.20	0.44	1.92
2.....	1.83	31.0	0.63	3.60	0.45	2.00	0.49	2.30
3.....	2.17	43.0	0.56	2.90	0.46	2.10	0.60	3.30
4.....	4.00	154.0	0.50	2.40	0.48	2.20	0.68	4.10
5.....	2.78	72.0	0.49	2.30	0.54	2.70	0.69	4.20
6.....	1.89	33.0	0.44	1.92	0.73	4.70	0.74	4.80
7.....	1.52	22.0	0.41	1.68	0.71	4.40	1.09	9.90
8.....	1.70	27.0	0.37	1.42	0.66	3.90	1.10	10.10
9.....	1.81	31.0	1.43	18.80	0.60	3.30	0.95	7.50
10.....	1.63	25.0	3.29	101.00	0.56	2.90	0.84	6.00
11.....	1.17	11.7	2.36	51.00	0.52	2.60	0.82	5.70
12.....	1.04	8.9	1.66	26.00	0.49	2.30	0.85	6.10
13.....	0.91	6.9	1.29	14.80	0.48	2.20	0.88	6.50
14.....	0.80	5.5	1.04	8.90	0.48	2.20	0.89	6.70
15.....	0.69	4.2	0.88	6.50	0.47	2.20	0.86	6.20
16.....	0.65	3.8	0.73	4.70	0.50	2.40	0.77	5.10
17.....	0.56	2.9	0.84	6.00	0.48	2.20	0.75	4.90
18.....	0.63	3.6	2.48	57.00	0.43	1.84	0.75	4.90
19.....	1.22	13.0	1.86	32.00	0.39	1.54	0.74	4.80
20.....	1.27	14.3	1.37	17.10	0.38	1.48	0.70	4.30
21.....	1.05	9.1	1.07	9.50	0.37	1.42	0.70	4.30
22.....	0.87	6.4	0.77	5.10	0.33	1.18	0.73	4.70
23.....	0.75	4.9	0.68	4.10	0.33	1.18	0.76	5.00
24.....	0.66	3.9	0.61	3.40	0.33	1.18	0.76	5.00
25.....	0.61	3.4	0.58	3.10	0.31	1.06	0.72	4.50
26.....	0.68	4.1	0.58	3.10	0.32	1.12	0.77	5.10
27.....	1.74	28.0	0.57	3.00	0.27	0.82	0.76	5.00
28.....	2.01	37.0	0.59	3.20	0.34	1.24	0.80	5.50
29.....	1.41	18.2	0.58	3.10	0.40	1.60	0.89	6.70
30.....	1.12	10.5	0.54	2.70	0.44	1.92	0.86	6.20
31.....	0.92	7.1	0.49	2.30			0.79	5.40

MONTHLY DISCHARGE of Mackay creek at Walsh, for 1916

(Drainage area 200 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (21-29).....	102.0	17.90	43.0	0.215	0.07	768
March.....	507.0	1.12	49.0	0.245	0.28	3,013
April.....	16.8	0.66	9.1	0.046	0.05	542
May.....	1,041.0	4.20	83.0	0.415	0.48	5,103
June.....	1,447.0	21.00	191.0	0.955	1.07	11,365
July.....	154.0	2.90	23.0	0.115	0.13	1,414
August.....	101.0	1.42	13.1	0.066	0.08	806
September.....	4.7	0.82	2.1	0.010	0.01	125
October.....	10.1	1.92	5.4	0.027	0.03	332
The period.....					2.20	23,468

SESSIONAL PAPER No. 25a

MEAN MONTHLY DISCHARGE in Second-feet of Mackay creek at Walsh

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		4.40	Nil	Nil	10.80	1.52	5.4	3.7	226
November		2.90 ^a	"						
December									
January									
February						43.00 ^f			
March	22.00 ^b	271.00 ^c		9.30 ^d	82.00 ^e	49.00		49.0	3,013
April	22.00	88.00	43.00	21.00	26.00	9.10		35.0	2,076
May	8.20	23.00	9.40	3.00	14.20	83.00		23.0	1,439
June	1.74	5.40	0.03	Nil	87.00	191.00		48.0	2,829
July	7.80	0.03	Nil	"	14.50	23.00		7.6	465
August	0.00	Nil	"	"	5.10	13.10		3.0	187
September	30.00	"	"	0.33	0.10	2.10		5.4	357
Total in acre-ft.	4,798	10,517	3,143	1,993	12,066	23,229			10,592

^a 1-8.^b 19-31.^c 26-31.^d 11-31.^e 16-31.^f 21-29.

BOXELDER CREEK AT YOUNG'S RANCH

Location.—On the NE. $\frac{1}{4}$ Sec. 2, Tp. 12, Rge. 30, W. 3rd Mer., two miles east of Walsh.

Records available.—March 11, 1911, to October 31, 1916. Discharge measurements only, 1909-10.

Gauge.—Vertical staff; elevation of zero maintained at 88.83 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Clay.

Discharge measurements.—Made with current-meter; by wading during low stages and from railway bridge down stream during flood stages.

Winter flow.—Station not maintained during the winter.

Observer.—John Young.

DISCHARGE MEASUREMENTS of Boxelder creek at Young's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 3	E. J. Switzer	9.5	4.59	0.45	0.88	2.00
April 20	do				0.72	0.55 ^w
May 18	do				Dry	Nil
May 29	do	50.6	157.00	0.68		106.00
June 13	R. J. McGuinness	60.0	257.00	0.88	7.30	225.00 ^x
June 13	do	47.0	144.00	0.87	5.15	125.00
June 20	E. J. Switzer	11.5	7.45	0.41	1.04	3.90
June 30	do	18.2	31.60	0.85	2.56	27.00
July 17	do				0.28	Nil
Aug. 16	do				0.71	0.53 ^w
Sept. 26	do				Dry	Nil
Nov. 2	do				0.74	0.65 ^e

^e Discharge estimated.^w Discharge determined by using an 18-inch weir.^x Slope measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Boxelder creek at Young's ranch, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1			0.99	2.60	0.93	2.10	Dry	Nil	4.12	81.0
2			0.89	1.83	0.83	1.41	0.73	0.85	2.67	30.0
3			0.89	1.83	0.88	1.76	0.73	0.85	1.87	13.0
4			0.89	1.83	0.83	1.41	0.73	0.85	1.61	9.3
5			0.89	1.83	0.83	1.41	0.78	1.10	1.81	12.1
6			0.89	1.83	0.83	1.41	0.73	0.85	2.70	30.0
7			0.89	1.83	0.83	1.41	0.73	0.85	5.40	137.0
8			0.89	1.83	0.83	1.41	0.70	0.70	3.59	59.0
9			2.19	10.00	0.78	1.10	0.68	0.64	1.74	11.1
10			4.34	50.00	0.73	0.85	0.63	0.49	1.58	8.9
11			4.94	75.00	0.83	1.41	0.58	0.36	4.55	99.0
12			6.69	125.00	0.98	2.50	0.58	0.36	7.31	226.0
13			5.64	90.00	0.88	1.76	0.43	0.06	5.35	134.0
14			3.69	63.00	0.88	1.76	0.36	Nil	3.51	56.0
15	11.26	329.0 ^e	2.23	19.80	0.88	1.76	0.28	"	2.07	16.6
16	9.15 ^a	250.0 ^e	1.83	12.30	0.88	1.76	Dry	"	1.63	9.6
17	7.04	213.0	1.43	7.10	0.88	1.76	"	"	1.39	6.6
18	5.69	150.0	1.53	8.30	0.86	1.62	"	"	1.26	5.1
19	4.59	101.0	1.43	7.10	0.78	1.10	"	"	1.18	4.3
20	3.89	71.0	1.48	7.70	0.72	0.80	"	"	1.04	3.0
21	3.09	42.0	2.23	19.80	0.68	0.64	0.33	"	1.04	3.0
22	3.04	40.0	2.58	28.00	0.63	0.49	0.73	0.85	0.99	2.6
23	2.54	27.0	1.93	14.00	0.60	0.40	0.83	1.41	1.19	4.4
24	2.19	19.0	1.58	8.90	0.53	0.26	0.98	2.50	2.64	29.0
25	1.59	9.1	1.63	9.60	0.33	Nil	1.13	3.80	2.84	34.0
26	1.64	9.7	1.38	6.50	Dry	"	2.28	21.00	2.94	37.0
27	1.39	6.6	1.13	3.80	"	"	3.63	61.00	2.64	29.0
28	1.34	6.0	1.43	7.10	"	"	5.23	129.00	2.14	18.0
29	1.04	3.0	1.58	8.90	"	"	5.23	129.00	1.59	9.1
30			1.33	5.90	"	"	6.08	168.00	2.56	27.0
31			0.98	2.50			6.43	184.00		

^a Gauge height interpolated.^{b-b} Ice conditions; discharge estimated.^e Discharge estimated.ⁱ⁻ⁱ Stream frozen over; does not affect gauge height.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Boxelder creek at Young's ranch, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	2.89	36.00	0.59	0.38	Dry	Nil	Dry	Nil
2.....	2.59	28.00	0.48	0.16	"	"	"	"
3.....	2.19	19.00	0.38	Nil	"	"	"	"
4.....	1.74	11.10	0.28	"	"	"	"	"
5.....	1.69	10.40	Dry	"	"	"	"	"
6.....	1.39	6.60	"	"	"	"	"	"
7.....	1.14	3.90	"	"	"	"	"	"
8.....	0.99	2.60	"	"	"	"	"	"
9.....	1.09	3.40	0.56	0.32	"	"	1.90	13.50
10.....	0.99	2.60	3.11	42.00	"	"	1.95	14.40
11.....	0.89	1.83	2.41	24.00	"	"	1.80	11.90
12.....	0.77	1.05	1.56	8.70	"	"	1.70	10.50
13.....	0.69	0.67	1.20	4.50	"	"	1.68	10.20
14.....	0.64	0.52	1.10	3.50	"	"	1.35	6.10
15.....	0.44	0.08	0.90	1.90	"	"	1.15	4.00
16.....	0.29	Nil	0.71	0.75	"	"	0.90	1.90
17.....	0.28	"	0.80	1.20	"	"	0.90	1.90
18.....	0.00	"	0.85	1.55	"	"	0.90	1.90
19.....	1.34	6.40	0.90	1.90	"	"	0.90	1.90
20.....	1.04	3.00	1.10	3.50	"	"	0.90	1.90
21.....	0.69	0.67	1.00	2.70	"	"	0.90	1.90
22.....	0.49	0.18	0.85	1.55	"	"	0.90	1.90
23.....	0.14	Nil	0.68	0.64	"	"	0.85	1.55
24.....	0.00	"	0.60	0.40	"	"	0.85	1.55
25.....	0.00	"	0.50	0.20	"	"	0.85	1.55
26.....	1.14	3.90	0.40	Nil	"	"	0.80	1.20
27.....	1.09	3.40	0.30	"	"	"	0.80	1.20
28.....	1.04	3.00	Dry	"	"	"	0.80	1.20
29.....	0.94	2.20	"	"	"	"	0.80	1.20
30.....	0.84	1.48	"	"	"	"	0.75	0.95
31.....	0.74	0.90	"	"	"	"	0.70	0.70

MONTHLY DISCHARGE of Boxelder creek at Young's ranch, for 1916

(Drainage area 104 square miles)

MONTH	DISCHARGE IN SECOND-FeET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (15-29).....	329.0	3.00	85.00	0.817	0.46	2,528
March.....	125.0	1.83	19.50	0.188	0.22	1,199
April.....	2.5	0.00	1.08	0.010	0.01	64
May.....	184.0	0.00	23.00	0.221	0.25	1,414
June.....	226.0	2.60	38.00	0.365	0.41	2,261
July.....	36.0	0.00	4.90	0.047	0.05	301
August.....	42.0	0.00	3.20	0.031	0.04	197
September.....	0.0	0.00	0.00	0.000	0.00	000
October.....	14.4	0.00	3.10	0.030	0.03	191
The period.....					1.47	8,155

MEAN MONTHLY DISCHARGE in Second-feet of Boxelder creek at Young's ranch

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		1.34 ^c	Nil	Nil	3.40	Nil	3.10	1.30	80
November									
December									
January									
February						85.00 ^b			
March	18.60 ^d			5.00 ^e	35.00 ^a	19.50		19.50	1,199
April	8.10	17.30	9.80	5.20	8.40	1.08		8.30	494
May	3.60	3.80	0.34	0.38	1.95	23.00		5.50	339
June	1.82	1.00	Nil	Nil	17.80	38.00		9.80	582
July	8.10	Nil	"	"	1.58	4.90		2.40	139
August	0.00	"	"	"	Nil	3.20		0.53	33
September	14.00	"	"	"	"	Nil		2.30	139
Total in acre-ft.	2,927	1,359	602	620	3,109	7,964			3,015

^a 16-31.^b 15-29.^c 1-4.^d 11-31.^e 3-31.

D. DRINNAN'S EAST DITCH FROM MCKAY CREEK

Location.—On the SE. $\frac{1}{4}$ Sec. 23, Tp. 13, Rge. 1 W. 4th Mer., 167 feet below headgate of ditch. *Records available*.—For irrigation season of 1916. Established November 11, 1915.

Gauge.—One section of metal rod, 0 to 3 feet, fastened to post driven into bed of ditch at left bank; zero of gauge 96.31, assumed.

Bench-mark.—4-inch by 2 feet post situated on right bank of creek about fifty feet down stream from headgate; assumed elevation 100.00 feet.

Channel.—Ditch is composed of sandy loam.

Discharge measurements.—Made by wading with current-meter or with weir.

Observer.—Dan Drinnan.

DISCHARGE MEASUREMENTS of D. Drinnan's East ditch from McKay creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 21	E. J. Switzer	7.7	4.25	0.41	1.91	1.75
April 21	do	8.2	5.71	0.76	2.11	4.40
April 21	do				1.64	1.27 ^w
April 21	do				1.51	0.51 ^w

^w Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of D. Drinnan's East ditch from McKay creek, for 1916

APRIL			MAY			MAY			JUNE		
Day	Gauge Height	Dis- charge	Day	Gauge Height	Dis- charge	Day	Gauge Height	Dis- charge	Day	Gauge Height	Dis- charge
	<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>
21 ^h	2.12	4.40	11	1.86 ^h	2.20	25	1.93 ^h	2.70	1	2.17	4.90
22	2.13	4.50	12	1.84	2.00	26	1.81	1.85	2	2.23	5.50
23	2.09 ^a	4.20	13	1.75	1.50	27	2.24	5.60	3	2.23	5.50
24	2.05	3.80	14	1.63	0.92	28	2.51	8.40	4	2.25	5.70
25	2.04	3.70	15	1.56	0.66	29	2.01	3.40	5	2.25 ^h	5.70
26	2.04 ^h	3.70	16	1.50 ^h	0.49	30	2.05	3.80			
						31	2.09	1.20			

^a Gauge height interpolated.^h Headgate opened April 21, closed April 26; opened May 11, closed May 16; opened May 25 and closed June 5.

SESSIONAL PAPER No. 25B

MONTHLY DISCHARGE of D. Drinnan's East ditch from MacKay creek, for 1916

MONTH	DISCHARGE IN SECOND-FEET			Total Discharge in Acre-ft.
	Maximum	Minimum	Mean	
April (21 to 30)	4.50	3.70	4.00	48
May (11-16 and 25-31)	8.40	0.49	2.90	75
June (1-5)	5.70	4.90	5.50	55
The period				178

MISCELLANEOUS DISCHARGE MEASUREMENTS made in Many Island Lake drainage basin, in 1916

Date	Engineer	Stream	Location	Width	Area of Section	Mean Velocity	Discharge
				<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Sec.-ft.</i>
May 18	E. J. Switzer	East br. Mackay creek ..	NW. 14-11-1-4	10.1	8.25	0.73	6.00
June 30	do	do	do	23.5	34.80	2.21	77.00
July 18	do	do	do	12.0	3.90	0.84	3.30
July 25	do	do	do	11.0	3.94	0.47	1.89
May 18	do	West. br. Mackay creek ..	do				0.28 ^w
June 30	do	do	do	8.0	3.62	0.90	3.30
July 18	do	do	do				0.32 ^w
July 25	do	do	do				0.29 ^w

^w Discharge determined by using an 18-inch weir.

ROSS CREEK DRAINAGE BASIN

General Description

Ross creek rises in Elkwater lake, a small body of water covering an area of approximately two square miles, situated in Township 8, Range 3, West of the 4th Meridian. The creek flows in a northerly direction as far as Irvine and then turns sharply to the westward and closely parallels the main line of the Canadian Pacific railway to Medicine Hat. Here it joins Sevenpersons river and the combined stream flows into the South Saskatchewan in Section 32, Township 12, Range 5, West of the 4th Meridian. The tributaries of Ross creek are Bullshead, which joins it in Section 21, Township 12, Range 5, West of the 4th Meridian, and Gros Ventre creek, which joins it in Section 14, Township 11, Range 3, West of the 4th Meridian.

The topography of this basin is exceedingly rough and rolling, and almost totally devoid of tree growth. The one exception is a small area of the forest reserve just south of Elkwater lake, which has a good stand of pine and spruce.

The Canadian Pacific Railway takes the water supply for its tank at Irvine from Ross creek and there are also several small irrigation schemes taking their supply from this stream and its tributaries.

MISS A. H. BROWN DITCH FROM GROS VENTRE CREEK

Location.—On the NW. $\frac{1}{4}$ Sec. 31, Tp. 8, Rge. 3, W. 4th Mer., about one-quarter mile down stream from dam.

Records available.—None.

Gauge.—Vertical staff driven into the bed of the ditch near the left bank; zero elevation maintained at 95.93 feet since establishment.

Bench-mark.—Permanent iron bench-mark located on the left bank four feet from the gauge; assumed elevation 100.00 feet.

Channel.—Composed of gravel loam.

Discharge measurements.—Made with current-meter or weir.

Observer.—L. C. Brown.

Remarks.—It is understood that no water was diverted during 1916.

ROSS CREEK AT IRVINE

Location.—On NW, $\frac{1}{4}$ Sec. 31, Tp. 11, Rge. 2, W. 4th Mer., at traffic bridge in town of Irvine, and about four hundred yards below the Canadian Pacific Railway Company's dam.

Records available.—July 29, 1909, to November 4, 1916.

Gauge.—Staff; the elevation of the zero of the gauge, 2,477.79 feet, has been unchanged since establishment.

Bench-mark.—Permanent iron bench-mark; elevation 2,500.43 feet above mean sea-level (Geodetic survey).

Channel.—Shifting.

Discharge measurements.—From traffic bridge by wading or with weir.

Winter flow.—Observations discontinued during winter.

Diversions.—Canadian Pacific Railway Company pump water from creek above dam for their water tank at Irvine.

Observer.—Observations were made by H. E. Price from February 15 to July 19, and by N. J. Corbett from July 19 to November 4, in 1916.

DISCHARGE MEASUREMENTS of Ross creek at Irvine, for 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 4	E. J. Switzer	13.8	11.18	1.21	1.42	13.6
April 19	do	13.4	9.46	1.17	1.30	11.1
May 19	do	12.0	5.11	0.58	0.89	3.0
May 27	do	31.5	85.69	1.54	4.31	132.0
June 12	R. J. McGuinness				7.54	492.0 _W
June 15	do	28.2	71.07	1.59	3.70	113.0
June 21	E. J. Switzer	24.8	33.19	0.98	2.23	33.0
June 29	do	25.5	42.20	1.19	2.57	50.0
July 18	do	25.6	39.22	1.02	2.26	42.0
July 18	do	25.0	18.64	2.08	2.29	39.0
July 24	do	16.3	14.37	0.92	1.35	13.2
Aug. 18	do	16.5	13.64	1.21	1.31	17.0
Aug. 22	do	13.0	8.59	1.16	1.10	10.0
Sept. 26	do	12.7	6.62	0.51	0.83	3.4
Nov. 2	do	13.0	6.50	1.18	0.95	7.7

^W Discharge determined by using 50-feet crest of C.P.R. dam as a weir.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Ross creek at Irvine, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1			1.56	18.1	1.68	21.0	1.16	9.4	4.11	127.0
2			1.51	16.9	1.66	20.0	1.16	9.4	4.14	129.0
3			1.46	15.7	1.46	15.7	1.16	9.4	4.39	146.0
4			1.41	14.6	1.42	14.8	1.16	9.4	4.34	142.0
5			1.36	13.5	1.41	14.6	1.16	9.4	5.14	206.0
6			1.26	11.4	1.36	13.5	1.16	9.4	5.12	204.0
7			1.34	13.1	1.32	12.6	1.14	9.0	5.11	203.0
8			2.26	38.0	1.26	11.4	1.12	8.6	5.10	202.0
9			3.46	90.0	1.26	11.4	1.05	7.2	6.22	324.0
10			6.06	304.0	1.26	11.4	1.03	6.8	8.16	572.0
11			9.56	751.0	1.27	11.6	1.03	6.8	8.31	591.0
12			7.69	512.0	1.27	11.6	1.03	6.8	7.54	493.0
13			5.09	202.0	1.27	11.6	1.03	6.8	6.12	312.0
14			4.26	137.0	1.27	11.6	1.05	7.2	5.06	199.0
15	1.06	5.0e	3.91	115.0	1.27	11.6	1.03	6.8	3.70	103.0
16	2.06	20.0	3.16	76.0	1.25	11.2	1.01	6.4	3.12	74.0
17	10.06	75.0	2.31	40.0	1.23	10.8	0.99	6.0	3.04	70.0
18	9.26	200.0e	2.26	38.0	1.25	11.2	0.92	4.8	2.09	33.0
19	6.96	418.0	2.46	45.0	1.30	12.2	0.89	4.2	2.04	31.0
20	5.07	200.0	2.46	45.0	1.27	11.6	0.89	4.2	1.14	9.0
21	4.56	158.0	1.66	20.0	1.26	11.4	0.88	4.0	2.23	37.0
22	4.08	125.0	2.56	49.0	1.25	11.2	0.94	5.1	1.11	8.4
23	3.09	72.0	2.46	45.0	1.24	11.0	0.99	6.0	3.10	73.0
24	2.53	48.0	2.11	33.0	1.22	10.6	1.89	27.0	3.12	74.0
25	2.09	33.0	1.56	18.1	1.19	10.0	2.24	38.0	3.14	75.0
26	1.91	27.0	1.98	29.0	1.13	8.8	3.50	92.0	3.74	105.0
27	1.38	13.9	2.46	45.0	1.08	7.8	4.31	140.0	3.64	100.0
28	1.66	20.0	2.36	42.0	1.01	6.4	5.04	197.0	3.69	102.0
29	1.61	19.3	2.07	32.0	1.04	7.0	5.07	200.0	2.57	50.0
30			1.66	20.0	1.07	7.6	5.10	202.0	4.74	172.0
31			1.68	21.0			4.13	128.0		

e-e Discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Ross creek at Irvine, for 1916.—*Concluded.*

DAY	July		August		September		October		November	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	4.84	180.0	1.10	8.2	0.88	4.0	0.89	4.2	0.98	5.8
2.....	5.04	197.0	2.00	30.0	0.88	4.0	0.91	4.6	0.95	5.3
3.....	5.94	290.0	1.02	6.6	.....	5.1 ^e	0.96	5.5	0.96	5.5
4.....	7.64	505.0	0.99	6.0	1.00	6.2	1.04	7.0	0.96	5.5
5.....	7.24	454.0	0.94	5.1	1.21	10.4	1.17	9.6	.....	.....
6.....	3.14	75.0	0.97	5.7	1.35	13.3	1.22	10.6	.....	.....
7.....	2.14	34.0	0.88	4.0	1.41	14.6	1.28	11.8	.....	.....
8.....	4.84	180.0	0.79	2.4	1.26	11.4	1.24	11.0	.....	.....
9.....	6.04	302.0	1.72	22.0	1.15	9.2	1.20	10.2	.....	.....
10.....	4.54	155.0	5.93	289.0	1.08	7.8	1.17	9.6	.....	.....
11.....	3.64	100.0	3.20	77.0	1.00	6.2	1.16	9.4	.....	.....
12.....	3.44	89.0	2.30	40.0	0.96	5.5	1.13	8.8	.....	.....
13.....	2.24	38.0	1.74	23.0	0.96	5.5	1.09	8.0	.....	.....
14.....	1.74	23.0	1.56	18.1	0.96	5.5	1.06	7.4	.....	.....
15.....	1.34	13.1	1.34	13.1	0.94	5.1	1.05	7.2	.....	.....
16.....	1.24	11.0	1.22	10.6	0.92	4.8	1.05	7.2	.....	.....
17.....	1.44	15.3	1.18	9.8	0.90	4.4	1.04	7.0	.....	.....
18.....	2.26	38.0	1.31	12.4	0.88	4.0	1.04	7.0	.....	.....
19.....	1.92	28.0	1.32	12.6	0.87	3.9	1.02	6.6	.....	.....
20.....	1.88	26.0	1.27	11.6	0.84	3.3	1.03	6.8	.....	.....
21.....	1.66	20.0	1.19	10.0	0.82	3.0	1.02	6.6	.....	.....
22.....	1.52	17.2	1.10	8.2	0.79	2.4	1.01	6.4	.....	.....
23.....	1.41	14.6	1.02	6.6	0.78	2.3	1.02	6.6	.....	.....
24.....	1.35	13.3	0.98	5.8	0.77	2.1	1.04	7.0	.....	.....
25.....	1.29	12.0	0.96	5.5	0.77	2.1	1.01	6.4	.....	.....
26.....	1.69	21.0	0.98	5.8	0.83	3.1	1.00	6.2	.....	.....
27.....	1.59	18.9	1.00	6.2	0.84	3.3	1.02	6.6	.....	.....
28.....	1.46	15.7	0.97	5.7	0.84	3.3	1.06	7.4	.....	.....
29.....	1.43	15.0	0.92	4.8	0.89	4.2	1.05	7.2	.....	.....
30.....	1.30	12.2	0.90	4.4	0.90	4.4	1.05	7.2	.....	.....
31.....	1.24	11.0	0.89	4.2	.....	.....	1.03	6.8	.....	.....

^e Discharge estimated.

MONTHLY DISCHARGE of Ross creek at Irvine, for 1916

(Drainage area 248 square miles)

MONTH	DISCHARGE IN SECOND-FEET ^a				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (15-29).....	418.0	5.0	96.0	0.387	0.22	2,856
March.....	751.0	11.4	92.0	0.371	0.43	5,657
April.....	21.0	6.4	11.8	0.048	0.05	702
May.....	202.0	4.0	38.0	0.153	0.18	2,337
June.....	591.0	8.4	166.0	0.669	0.75	9,878
July.....	505.0	11.0	94.0	0.379	0.44	5,780
August.....	289.0	2.4	22.0	0.089	0.10	1,353
September.....	14.6	2.1	5.5	0.022	0.02	327
October.....	11.8	4.2	7.5	0.030	0.03	461
November (1-4).....	5.8	5.3	5.5	0.022	0.00	44
The period.....					2.22	20,395

SESSIONAL PAPER No. 25b

MEAN MONTHLY DISCHARGE in Second-feet of Ross creek at Irvine

MONTH	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		1.52	0.02	9.90	0.84	7.5	4.0	243
November.....		0.46 ^b				5.5 ^e		
December.....								
January.....								
February.....					96.00 ^d			
March.....			28.00	121.00 ^e	92.00		60.0	3,600
April.....	94.00 ^a	72.00	42.00	46.00	11.80		43.0	2,558
May.....	23.00	12.50	7.20	16.40	38.00		19.4	1,196
June.....	9.50	1.25	0.13	52.00	166.00		46.0	2,724
July.....	0.43	1.92	Nil	18.70	94.00		23.0	1,415
August.....	3.60	0.52	"	11.90	22.00		760.0	468
September.....	7.50	0.02	"	0.38	5.50		2.7	159
Total in Acre-feet.....	7,733	5,397	4,672	14,392	28,942			12,453

^a 4-30.^b 1-16.^c 11-31.^d 15-29.^e 1-4.

J. K. DRINNAN'S MAIN SOUTH DITCH FROM ROSS CREEK

Location.—On the NE. $\frac{1}{4}$ Sec. 7, Tp. 12, Rge. 3, W. 4th Mer., about 1,130 feet below intake of ditch.

Records available.—For irrigation season of 1916.

Gauge.—Vertical staff fastened to a post driven into bed of ditch at left bank; assumed elevation of zero of gauge 96.12 feet.

Bench-mark.—Permanent iron bench-mark, located on left bank of creek, twenty feet down stream from dam and ninety feet back from creek; assumed elevation 100.00 feet.

Channel.—Ditch is composed of sandy loam.

Discharge measurements.—Made by wading with current-meter or with weir.

Observer.—J. K. Drinnan.

DISCHARGE MEASUREMENTS of J. K. Drinnan's Main South ditch from Ross creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 19.....	E. J. Switzer.....	9.5	6.15	0.74	1.28	4.60
May 19.....	do.....	9.2	5.70	0.68	1.24	3.90
May 19.....	do.....	8.9	5.38	0.68	1.19	3.70
May 19.....	do.....	8.2	3.86	0.28	0.95	1.09

DAILY GAUGE HEIGHT AND DISCHARGE of J. K. Drinnan's Main South ditch from Ross creek, for 1916

APRIL			MAY			MAY			MAY		
Day	Gauge Height	Dis- charge	Day	Gauge Height	Dis- charge	Day	Gauge Height	Dis- charge	Day	Gauge Height	Dis- charge
	<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>
23	1.53	7.90	1	0.83	0.63	8	0.78	0.50	15	0.53	0.19
24	1.38	5.90	2	0.83	0.63	9	0.83	0.63	16	0.33	0.07
25	0.63	0.27	3	0.83	0.63	10	0.88	0.79	17	0.38	0.09
26	0.63	0.27	4	0.78	0.50	11	0.68	0.33	18	0.73	0.41
27	0.78	0.50	5	0.88	0.79	12	0.53	0.23	19	0.99	1.35
28	2.10 ^e	6	6	0.88	0.79	13	0.53	0.19	20	0.31	0.06
29	1.38	5.90	7	0.88	0.79	14	0.53	0.19			
30	0.83	0.63									

^e Discharge estimated.

MONTHLY DISCHARGE of J. K. Drinnan's Main South ditch from Ross creek, for 1916

MONTH	DISCHARGE IN SECOND-FEET			Total Discharge in Acre-ft.
	Maximum	Minimum	Mean	
April (23-30).....	7.90	0.27	2.90	46
May 1-20).....	1.35	0.06	0.49	19
The period.....				65

J. K. DRINNAN'S MAIN NORTH DITCH FROM ROSS CREEK

Location.—On the NE. $\frac{1}{4}$ Sec. 7, Tp. 12, Rge. 3, W. 4th Mer., 300 feet below intake of ditch and about one mile east of Pashley P.O.

Records available.—From April 28 to May 13, 1916.

Gauge.—Vertical staff fastened to a post driven in bed of ditch at left bank elevation of zero of gauge 95.68 feet.

Bench-mark.—Permanent iron bench-mark, located on left bank of creek, twenty feet down stream from dam and ninety feet back from creek; assumed elevation 100.00 feet.

Channel.—Ditch is composed of sandy loam.

Discharge measurements.—Made by wading with current-meter or with weir.

Observer.—J. K. Drinnan.

DISCHARGE MEASUREMENTS of J. K. Drinnan's Main North ditch from Ross creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 19.....	E. J. Switzer.....	8.9	4.12	0.17	1.60	0.69
May 20.....	do.....				1.38	0.52 ^e
May 20.....	do.....				1.33	0.36 ^e

^e Discharge determined by using an 18-inch weir.

DAILY GAUGE HEIGHT AND DISCHARGE of J. K. Drinnan's Main North ditch from Ross creek, for 1916

APRIL			MAY			MAY			MAY		
Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge	Day	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>		<i>Feet</i>	<i>Sec.-ft.</i>
28	2.24 ^h	2.3	1	2.09	2.10	8	2.09	2.10	15	1.09	0.15
29		2.5 ^e	2	2.14	2.30	9	2.24	2.60	16	0.59	0.01
30	2.19	2.4	3	2.24	2.60	10	2.09	2.10	17	0.69	0.02
			4	2.09	2.10	11	1.89	1.53	18	0.79	0.03
			5	2.14	2.30	12	1.24	0.27	19	0.88 ^h	0.05
			6	2.04	1.98	13	1.19	0.22			
			7	2.04	1.98	14	1.15	0.19			

^e Discharge estimated.

^h Headgate opened on April 28 and closed on May 19.

SESSIONAL PAPER No. 25b

MONTHLY DISCHARGE of J. K. Drinnan's Main North ditch from Ross creek, for 1916

MONTH	DISCHARGE IN SECOND-FEET			Total Discharge in Acre-ft.
	Maximum	Minimum	Mean	
April (28-30)	2.50	2.30	2.40	14
May (1-19)	2.60	0.01	1.30	49
The period				63

J. K. DRINNAN'S NORTH LATERAL DITCH FROM ROSS CREEK

Location.—On the NE. $\frac{1}{4}$ Sec. 7, Tp. 12, Rge. 3, W. 4th Mer., located 40 feet below head of lateral ditch and about one mile east of Pashley P.O.

Records available.—Gauge heights taken from May 13 to May 19, 1916. No discharge measurements during 1916.

Gauge.—Vertical staff located at right bank of ditch; zero elevation 97.49 feet.

Bench-mark.—Permanent iron bench-mark located on left bank of creek, twenty feet down stream from dam and ninety feet back from creek; assumed elevation 100.00 feet.

Channel.—Composed of sandy loam.

Observer.—J. K. Drinnan.

Remarks.—Water used for irrigation purposes for seven days, May 13 to May 19; estimated average discharge, 1.5 second-feet.

J. K. DRINNAN'S SOUTH LATERAL DITCH FROM ROSS CREEK

Location.—On the NE. $\frac{1}{4}$ Sec. 7, Tp. 12, Rge. 3, W. 4th Mer., located 65 feet below head of lateral ditch and about three-quarters of a mile east of Pashley P.O.

Records available.—Gauge heights taken from April 23 to April 29, 1916; no discharge measurements in 1916.

Gauge.—Vertical staff located at left bank of creek; zero elevation 96.77 feet.

Bench-mark.—Permanent iron bench-mark situated on left bank, twenty feet down stream from dam and ninety feet back from creek; assumed elevation 100.00 feet.

Channel.—Composed of sandy loam.

Observer.—J. K. Drinnan.

Remarks.—Water used for irrigation purposes for seven days, April 23 to April 29; estimated average discharge 0.75 second-feet.

BULLSHEAD CREEK AT JOHNSTON'S RANCH

Location.—On the SW. $\frac{1}{4}$ Sec. 4, Tp. 11, Rge. 5, W. 4th Mer., at J. A. Johnston's ranch, Woolchester, Alberta. This station was established May 15, 1915, and the former station at Clark's ranch was discontinued May 16, 1915.

Records available.—May 15, 1915, to October 31, 1916.

Gauge.—Vertical staff. The zero has been maintained at 94.31 feet.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Practically permanent.

Winter flow.—Station discontinued during winter season.

Observer.—J. A. Johnston.

DISCHARGE MEASUREMENTS of Bullshead creek at Johnston's ranch, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 13.....	E. J. Switzer.....	22.8	10.44	0.60	1.42	6.3
May 26.....	do.....	59.5	59.68	0.78	1.86	47.0
June 28.....	do.....	50.0	41.41	0.24	1.48	10.0
July 19.....	do.....	24.7	12.06	0.53	1.40	6.4
Aug. 21.....	do.....	18.9	9.22	0.38	1.32	3.0

DAILY GAUGE HEIGHT AND DISCHARGE of Bullshead creek at Johnston's ranch, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			1.29 ^b	5.0	1.69	28.0	1.25	1.60	1.57	16.8
2.....			1.21	4.0	1.62	21.0	1.25	1.60	1.57	16.8
3.....			1.19	3.0	1.58	17.6	1.25	1.60	1.63	22.0
4.....			1.17	2.0	1.52	12.9	1.25	1.60	1.78	37.0
5.....			1.17	1.0	1.46	8.9	1.24	1.44	1.79	38.0
6.....			^x	Nil	1.47	9.6	1.24	1.44	1.89	51.0
7.....				"	1.47	9.6	1.24	1.44	1.97	61.0
8.....				"	1.47	9.6	1.24	1.44	1.87	48.0
9.....				"	1.48	10.2	1.24	1.44	1.86	47.0
10.....			^x	"	1.49	10.9	1.24	1.44	2.14	84.0
11.....			1.81	40.0	1.49	10.9	1.23	1.28	3.04	210.0
12.....	1.49 ^b	10.0	2.45 ^b	100.0	1.49	10.9	1.22	1.12	2.98	201.0
13.....	1.56	15.0	2.44	126.0	1.42	6.8	1.22	1.12	2.79	175.0
14.....	1.61 ^b	20.0	2.97	200.0	1.42	6.8	1.22	1.12	1.93	56.0
15.....	1.72	30.0	2.77	172.0	1.38	5.1	1.22	1.12	1.71	30.0
16.....	2.30	106.0	2.69	161.0	1.38	5.1	1.19	0.74	1.56	16.0
17.....	3.09	217.0	2.21	94.0	1.38	5.1	1.19	0.74	1.29	2.4
18.....	3.02	207.0	1.91	53.0	1.37	4.7	1.19	0.74	1.49	10.9
19.....	2.80	176.0	1.69	28.0	1.36	4.4	1.16	0.56	1.46	8.9
20.....	2.21	94.0	1.72	31.0	1.32	3.2	1.16	0.56	1.42	6.8
21.....	1.92	54.0	1.74	33.0	1.32	3.2	1.15	0.50	1.36	4.4
22.....	2.08	76.0	1.80	40.0	1.32	3.2	1.14	0.46	1.36	4.4
23.....	2.07	74.0	1.94	57.0	1.29	2.4	1.18	0.68	1.48	10.2
24.....	1.99	63.0	1.87	48.0	1.29	2.4	1.42	6.80	1.50	11.5
25.....	1.81	41.0	1.76	35.0	1.29	2.4	1.61	20.00	1.45	8.3
26.....	1.75	34.0	1.75	34.0	1.29	2.4	1.86	47.00	1.44	7.8
27.....	1.63	22.0	1.75	34.0	1.27	2.0	2.01	66.00	1.41	6.3
28.....	1.54	14.4	1.73	32.0	1.27	2.0	1.69	28.00	1.48	10.2
29.....	1.50	11.5	1.73	32.0	1.27	2.0	1.66	25.00	1.43	7.3
30.....			1.73	32.0	1.27	2.0	1.61	20.00	1.77	36.0
31.....			1.69	28.0			1.61	20.00		

^b Ice conditions, Feb. 12 to 14 and Mar. 1 to 12; discharge estimated.
^{x-z} Creek frozen solid.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Bullshead creek at Johnston's ranch, for 1916
—Concluded—

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.	1.66	25.00	1.33	3.40	1.19	0.74	1.16	0.56
2.	1.65	24.00	1.27	2.00	1.18	0.68	1.24	1.44
3.	2.03	69.00	1.17	0.62	1.42	6.80	1.29	2.40
4.	2.38	117.00	1.16	0.56	1.66	25.00	1.23	1.28
5.	1.87	48.00	1.16	0.56	1.65	24.00	1.27	2.00
6.	1.63	22.00	1.13	0.42	1.51	12.20	1.35	4.00
7.	1.63	22.00	1.08	0.26	1.43	7.30	1.35	4.00
8.	1.85	49.00	1.02	0.14	1.43	7.30	1.33	3.40
9.	1.98	62.00	0.96	Nil	1.42	6.80	1.33	3.40
10.	1.89	51.00	0.96	"	1.37	4.70	1.28	2.20
11.	1.84	44.00	1.09	0.28	1.37	4.70	1.27	2.00
12.	1.77	36.00	2.62	151.00	1.36	4.40	1.27	2.00
13.	1.56	16.00	2.43	124.00	1.39	5.40	1.27	2.00
14.	1.41	6.30	1.98	62.00	1.32	3.20	1.27	2.00
15.	1.37	4.70	1.86	47.00	1.27	2.00	1.27	2.00
16.	1.29	2.40	1.86	47.00	1.25	1.60	1.27	2.00
17.	1.26	1.80	1.79	39.00	1.24	1.44	1.26	1.80
18.	1.35	4.00	1.90	52.00	1.20	0.80	1.28	2.20
19.	1.40	5.80	1.89	51.00	1.20	0.80	1.27	2.00
20.	1.35	4.00	1.49	10.90	1.20	0.80	1.27	2.00
21.	1.35	4.00	1.32	3.20	1.19	0.74	1.26	1.80
22.	1.29	2.40	1.46	8.90	1.19	0.74	1.27	2.00
23.	1.28	2.20	1.46	8.90	1.16	0.56	1.26	1.80
24.	1.25	1.60	1.41	6.30	1.12	0.38	1.26	1.80
25.	1.23	1.28	1.33	3.40	1.17	0.62	1.29	2.40
26.	1.23	1.28	1.32	3.20	1.16	0.56	1.29	2.40
27.	1.25	1.60	1.32	3.20	1.16	0.56	1.28	2.20
28.	1.45	8.30	1.30	2.60	1.16	0.56	1.28	2.20
29.	1.42	6.80	1.24	1.44	1.16	0.56	1.27	2.00
30.	1.40	5.80	1.19	0.74	1.16	0.56	1.27	2.00
31.	1.35	4.00	1.19	0.74	.....	.....	1.27	2.00

MONTHLY DISCHARGE of Bullshead creek at Johnston's ranch, for 1916

(Drainage area 134 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (12-29).....	217.0	10.00	70.0	0.522	0.35	2,499
March.....	200.0	0.00	46.0	0.343	0.40	2,828
April.....	28.0	2.00	7.5	0.056	0.06	446
May.....	66.0	0.46	8.3	0.062	0.07	510
June.....	210.0	2.40	42.0	0.313	0.35	2,499
July.....	117.0	1.28	21.0	0.157	0.18	1,291
August.....	151.0	0.00	20.0	0.149	0.17	1,230
September.....	25.0	0.38	4.2	0.031	0.03	250
October.....	4.0	0.56	2.2	0.016	0.02	135
The period.....					1.63	11,688

STARK AND BURTON DITCH FROM BULLSHEAD CREEK

Location.—On the SE. $\frac{1}{4}$ Sec. 17, Tp. 11, Rge. 5, W. 4th Mer., at Stark and Burton's ranch, near Medicine Hat.

Records available.—Estimates are available for the years of 1912-14, complete records for 1915-16.

Gauge.—Vertical staff; the zero of the gauge has been maintained at 94.58 feet since establishment.

Bench-mark.—Permanent iron bench-mark established twenty-nine feet SW. from gauge; assumed elevation 100.00 feet.

Channel.—Composed of sand and gravel.

Discharge measurements.—Made with a current-meter by wading.

Control.—On September 14, 1915, a permanent seven-foot sharp crested rectangular weir was installed twenty-five feet below the gauge. The elevation of the crest is maintained at 95.39 feet.

Observer.—R. E. Stark.

DISCHARGE MEASUREMENTS of Stark and Burton ditch from Bullshead creek, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 17	E. J. Switzer	9.5	3.55	1.09	1.08	3.90
April 17	do	9.0	2.65	0.89	0.99	2.40
April 17	do				0.89	1.65 ¹⁰
May 26	do				0.69	0.44 ¹⁰
Aug. 21	do	8.9	2.97	0.88	1.02	2.60
Aug. 21	do	9.0	3.20	0.90	1.06	2.90

¹⁰ Discharge measured with 18-inch weir.

DAILY GAUGE HEIGHT AND DISCHARGE of Stark and Burton ditch from Bullshead creek, for 1916

DAY	March		April		May		June		July		August	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1			0.85	1.37	0.95	2.10						
2			0.85	1.37	0.95	2.10						
3			1.05	3.00	0.84	1.31						
4			1.05	3.00	0.74	0.69						
5			0.95	2.10	0.74	0.69						
6			1.05	3.00	0.74	0.69						
7			1.05	3.00	0.74	0.69						
8			1.35	8.60	0.74	0.69						
9			1.35	8.60	0.74	0.64						
10			1.35	8.60	0.74	0.64						
11			1.15	4.60	0.68	0.40						
12			1.05	3.00	0.68	0.40						
13			1.25	6.50	0.68	0.40						
14			1.25	6.50	0.74	0.69						
15			1.25	6.50		0.69 ^e			1.04 ^h	2.90		
16			1.05	3.00		0.69 ^e			1.04	2.90		
17			1.05	3.00	0.74	0.69			1.04	2.90		
18			1.05	3.00	0.74	0.69			1.04 ^h	2.90		
19			0.95	2.10	0.73	0.64						2.9 ^e
20			0.95	2.10	0.63	0.18						3.0 ^e
21			0.95	2.10		0.31 ^e					1.06	3.2
22			0.95	2.10		0.49 ^e						2.9 ^e
23			0.95	2.10	0.73	0.64						
24			0.95	2.10	0.83	1.24						
25			0.85	1.37	0.93 ^h	1.94						
26			0.75	0.74	0.92	1.86						
27			0.75	0.74								
28			0.75	0.74								
29	0.85 ^h	1.37	0.75	0.74								
30	0.95	2.10	1.05	3.00								
31	0.85	1.37										

^e Discharge estimated.

^h Headgate opened Mar. 29, closed May 25; opened July 15, closed July 18.

SESSIONAL PAPER NO. 25B

MONTHLY DISCHARGE of Stark and Burton ditch from Bullshead creek, for 1916

MONTH	DISCHARGE IN SECOND-FEET			RUN-OFF
	Maximum	Minimum	Mean	Total Discharge in acre-ft.
March (29-31)	2.10	1.37	1.61	10
April	8.60	0.74	3.30	196
May (1-26)	2.10	0.18	0.85	44
June				
July (15-18)	2.90	2.90	2.90	23
August (19-22)	3.20	2.90	3.00	24
The period				297

BULLSHEAD CREEK NEAR DUNMORE

Location.—On SE. $\frac{1}{4}$ Sec. 16, Tp. 12, Rge. 5, W. 4th Mer., at the traffic bridge about four miles east of Medicine Hat, and about one mile above the junction of Ross and Bullshead creeks.

Records available.—July 26, 1909, to October 31, 1916.

Gauge.—Staff. Zero elevation of gauge, 2,295.65 during 1909-11; zero elevation of gauge 2,295.01 during 1912; zero elevation of gauge 2,295.06 during 1913-16.

Bench-mark.—Permanent iron bench-mark; elevation 2,305.53 above mean sea-level (Geodetic Survey).

Channel.—Shifting.

Discharge measurements.—From bridge, or by wading with meter; or with a weir.

Winter flow.—Station not maintained during the winter.

Remarks.—It has been impossible to secure an observer at reasonable cost and daily observations have not, therefore, been secured during 1914-15-16.

DISCHARGE MEASUREMENTS of Bullshead creek near Dunmore, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 12	E. J. Switzer	8.3	2.11	0.68	1.31	1.44
May 26	do	29.4	19.38	1.62	2.00	31.00
June 15	R. J. McGuinness	28.0	35.55	0.86	1.95	31.00
June 26	E. J. Switzer	10.2	6.28	1.57	1.55	9.90
July 24	do	9.0	3.12	0.84	1.25	2.60
Aug. 21	do	7.9	2.32	0.52	1.14	1.20

SEVENPERSONS RIVER DRAINAGE BASIN

General Description

Seven persons river lies between the South Saskatchewan river and the Cypress hills and empties into the South Saskatchewan river at Medicine Hat. The drainage area consists mostly of open level prairie which has a small rainfall and a run-off confined chiefly to the spring freshet. The creek has a considerable flow during the month of April, but the discharge decreases to nil about June.

There are no irrigation works of importance on this stream and the records are valuable chiefly for statistical purposes.

SEVENPERSONS RIVER AT MEDICINE HAT

Location.—On NE. $\frac{1}{4}$ Sec. 30, Tp. 12, Rge. 5, W. 4th Mer., at the bridge on the road between Medicine Hat and Dunmore and about one and one-half miles east of the Canadian Pacific Railway station at Medicine Hat.

Records available.—April 27, 1910, to October 11, 1916.

Gauge.—Vertical staff; elevation of zero maintained at 86.68 feet since establishment.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Shifting.

Discharge measurements.—From bridge, by wading or with a weir.

Winter flow.—Observations discontinued during the winter.

Observer.—A. Hooper.

DISCHARGE MEASUREMENTS of Sevenpersons river at Medicine Hat, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
April 12.....	E. J. Switzer.....	24.0	9.26	0.39	1.86	3.60
May 24.....	do.....	4.6	1.13	0.43	1.63	0.49
June 15.....	R. J. McGuinness.....	47.0	87.10	2.30	3.13	200.00
June 26.....	E. J. Switzer.....	38.3	27.25	0.70	2.10	19.20
July 22.....	do.....	28.4	11.38	0.84	1.93	9.50
Aug. 21.....	do.....	15.6	11.30	0.52	1.84	6.00
Oct. 30.....	do.....	6.0	0.67	0.52	1.70	0.35

DAILY GAUGE HEIGHT AND DISCHARGE of Sevenpersons river at Medicine Hat, for 1916

DAY	February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			280.0	2.22	28.0	1.74	3.00	2.05	16.1	
2.....			290.0	2.20	26.0	1.74	3.00	2.10	19.2	
3.....			300.0	2.20	26.0	1.73	2.70	2.16	23.0	
4.....			350.0	2.16	23.0	1.72	2.50	2.38	43.0	
5.....			4.45	485.0	2.10	19.2	1.72	2.50	2.34	39.0
6.....			4.45	485.0	2.05	16.1	1.70	1.90	2.30	35.0
7.....			4.45	485.0	1.98	12.3	1.74	3.00	2.27	32.0
8.....			4.45	485.0	1.98	12.3	1.73	2.70	2.25	30.0
9.....			4.43	480.0	1.97	11.8	1.72	2.50	2.24	29.0
10.....			4.38	470.0	1.95	10.8	1.73	2.70	2.24	29.0
11.....			4.19	450.0	1.95	10.8	1.74	3.00	2.24	29.0
12.....			3.77 ^b	400.0	1.86	7.0	1.74	3.00	2.90	138.0
13.....			5.17	750.0	1.93	9.9	1.72	2.50	3.10	192.0
14.....			4.50	570.0	1.92	9.5	1.72	2.50	3.40	272.0
15.....			4.11	464.0	1.92	9.5	1.72	2.50	3.13	200.0
16.....			3.53	308.0	1.90	8.6	1.72	2.50	3.44	283.0
17.....			3.50	300.0	1.88	7.8	1.72	2.50	3.46	289.0
18.....			2.80	112.0	1.86	7.0	1.72	2.50	3.10	192.0
19.....			2.66	82.0	1.85	6.6	1.72	2.50	2.96	154.0
20.....			2.66	82.0	1.83	5.9	1.73	2.70	2.80	112.0
21.....			2.75	100.0	1.82	5.6	1.70	1.90	2.40	45.0
22.....	3.70	354	2.80	112.0	1.80	4.9	1.68	1.38	2.26	31.0
23.....	3.70	354	3.11	194.0	1.80	4.9	1.65	0.60	2.18	25.0
24.....	3.14	202	3.05	178.0	1.78	4.2	1.63	0.36	2.13	21.0
25.....	3.14	202	2.50	57.0	1.77	3.9	1.63	0.36	2.15	22.0
26.....	3.53	308	2.40	45.0	1.75	3.3	1.62	0.24	2.10	19.2
27.....	3.54	310	2.35	40.0	1.74	3.0	1.62	0.24	2.30	35.0
28.....	^b	270	2.30	35.0	1.74	3.0	1.86	7.00	2.38	43.0
29.....		270	2.25	30.0	1.74	3.0	1.90	8.60	2.40	45.0
30.....			2.11	19.9	1.73	2.7	1.96	11.30	2.42	47.0
31.....			2.15	22.0			1.99	12.80		

b-b Ice conditions; discharge estimated.

SESSIONAL PAPER No. 25a

DAILY GAUGE HEIGHT AND DISCHARGE of Sevenpersons river at Medicine Hat, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	2.44	49.0	1.86	7.0	1.79	4.6	1.77	3.90
2.....	2.44	49.0	1.85	6.6	1.77	3.9	1.79	4.60
3.....	2.60	71.0	1.83	5.9	1.79	4.6	1.80	4.90
4.....	3.50	300.0	1.82	5.6	1.81	5.2	1.82	5.60
5.....	3.40	272.0	1.80	4.9	1.83	5.9	1.83	5.90
6.....	3.63	335.0	1.90	8.6	1.84	6.3	1.85	6.60
7.....	3.65	340.0	2.10	19.2	1.85	6.6	1.88	7.80
8.....	3.75	368.0	2.50	57.0	1.86	7.0	1.88	7.80
9.....	3.19	216.0	2.76	103.0	1.87	7.4	1.87	7.40
10.....	2.77	105.0	2.80	112.0	1.88	7.8	1.87	7.40
11.....	2.50	57.0	2.82	117.0	1.87	7.4	1.86	7.00
12.....	2.40	45.0	2.84	122.0	1.85	6.6	1.86	7.00
13.....	2.22	28.0	2.75	100.0	1.82	5.6	1.85	6.60
14.....	2.18	25.0	2.60	71.0	1.80	4.9	1.84	6.30
15.....	2.11	19.9	2.50	57.0	1.77	3.9	1.83	5.90
16.....	2.11	19.9	2.38	43.0	1.75	3.3	1.82	5.60
17.....	2.10	19.2	2.30	35.0	1.74	3.0	1.80	4.90
18.....	2.10	19.2	2.15	22.0	1.74	3.0	1.79	4.60
19.....	2.09	18.6	2.00	13.3	1.75	3.3	1.78	4.20
20.....	2.09	18.6	1.98	12.3	1.76	3.6	1.77	3.90
21.....	2.08	17.9	1.84	6.3	1.76	3.6	1.77	3.90
22.....	1.93	9.9	1.91	9.0	1.77	3.9	1.76	3.60
23.....	2.01	13.9	1.90	8.6	1.77	3.9	1.76	3.60
24.....	1.98	12.3	1.89	8.2	1.77	3.9	1.77	3.90
25.....	1.96	11.3	1.88	7.8	1.77	3.9	1.77	3.90
26.....	1.94	10.4	1.85	6.6	1.77	3.9	1.78	4.20
27.....	1.93	9.9	1.88	7.8	1.78	4.2	1.78	4.20
28.....	1.92	9.5	1.86	7.0	1.78	4.2	1.78	4.20
29.....	1.90	8.6	1.84	6.3	1.78	4.2	1.77	3.90
30.....	1.90	8.6	1.82	5.6	1.79	4.6	1.70	1.90
31.....	1.88	7.8	1.80	4.9	.....	.....	1.75	3.30

MONTHLY DISCHARGE of Sevenpersons river at Medicine Hat, for 1916

(Drainage area 797 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
February (22-29).....	354.0	202.00	284.0	0.356	0.11	4,505
March.....	750.0	19.90	273.0	0.343	0.40	16,786
April.....	28.0	2.70	10.2	0.013	0.01	607
May.....	12.8	0.24	3.1	0.004	0.00	191
June.....	289.0	16.10	83.0	0.104	0.12	4,939
July.....	368.0	7.80	80.0	0.100	0.12	4,919
August.....	122.0	4.90	32.0	0.040	0.05	1,968
September.....	7.8	3.00	4.8	0.006	0.01	286
October.....	7.8	1.90	5.1	0.006	0.01	314
The period.....	.....	.....	.....	.....	0.83	34,515

LAKE JOHNSTON DRAINAGE BASIN

General Description

Lake Johnston lies about twenty miles southwest of the city of Moosejaw. It is about twenty-five miles long and fifteen miles wide, and covers an area of nearly five townships. Almost all the drainage into the lake comes from the south and west, through Wood river. The main tributaries of Wood river are Wiwa creek, Notukeu creek, Pinto creek and Wood creek. These drain a large area, but owing to the limited rainfall and the small slope of the drainage basin the run-off is comparatively small.

Lake Johnston has no surface outlet and there has been no surface flow from lake Chaplin to lake Johnston for several years, but it will be noted that the elevations of the two lakes are the same. There is often considerable flow in Wood river in the spring, and there is always some discharge at all seasons; nevertheless, the water in the lake has, during recent years, receded.

The lower part of Wood river has a very small fall and is more of the nature of a long slough than that of a running stream. The channel is from twenty to fifty feet wide, and is from two to five feet deep. The bottom is composed of soft clay and is covered with weeds and grass. There is so little fall that it would be impossible to take out water by gravity and a dam would flood a large area of good agricultural land. There is, therefore, little possibility of irrigation development in this basin.

This drainage basin includes a large area of very good agricultural land. This is pretty well taken up by settlers and is being farmed with good results.

There is one irrigation scheme on Pearce creek, and the only regular gauging station in the drainage basin is on Notukeu creek.

NOTUKEU CREEK NEAR VANGUARD

Location.—On the NW. $\frac{1}{4}$ Sec. 10, Tp. 11, Rge. 10, W. 3rd Mer.

Records available.—August 6, 1914, to December 31, 1916.

Gauge.—Vertical staff, below a dam, one-quarter mile down stream from bridge. Zero elevation maintained at elevation 77.04 feet.

Bench-mark.—Permanent iron on right bank, thirty feet up stream from gauge; assumed elevation 85.07 feet.

Channel.—Above dam; gauge heights affected by changes in dam. Below dam, permanent.

Discharge measurements.—With current-meter by wading or from traffic bridge.

Observer.—Miss Constance Ripley.

DISCHARGE MEASUREMENTS of Notukeu creek near Vanguard, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 8	W. R. McCaffrey				<i>b</i>	<i>x</i>
Jan. 20	do				<i>b</i>	<i>x</i>
Feb. 17	H. W. Rowley				<i>b</i>	<i>x</i>
Mar. 7	do				<i>b</i>	<i>x</i>
Mar. 24	E. J. Switzer	105.0	778.33	2.06	13.85	1,602.0
April 8	do	41.0	114.30	1.43	3.28	164.0
May 6	do	37.7	53.48	0.71	1.42	38.0
June 12	do	38.4	60.61	0.86	1.64	53.0
July 4	do	61.0	242.55	2.04	6.81	495.0
Aug. 1	do	38.3	54.90	0.68	1.36	38.0
Aug. 12	do	38.0	43.13	0.44	1.07	19.0
Oct. 12	F. R. Shenstone	23.6	10.69	1.48	1.01	16.0
Nov. 7	do	19.0	6.75	1.75	0.92	11.9
Nov. 28	do	10.0	3.85	0.52	1.01 <i>b</i>	2.0
Dec. 19	do	7.5	3.10	0.70	0.98 <i>b</i>	2.2

b Ice conditions, Jan. 1 to Mar. 10 and Nov. 14 to Dec. 31.

x Creek frozen solid; no discharge, Jan. 1 to Mar. 10 and Dec. 24 to Dec. 31.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Notukeu creek near Vanguard, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	0.30	Nil	Dry	Nil	Dry	Nil	.....	1,600	1.56	46	2.35	96
2.....	0.28	"	"	"	"	"	.....^b	1,000	1.47	41	2.27	90
3.....	0.26	"	"	"	"	"	6.53	462	1.47	41	2.18	84
4.....	0.26	"	"	"	"	"	5.04	310	1.53	44	2.02	74
5.....	0.25	"	"	"	"	"	4.70	279	1.47	41	1.87	64
6.....	0.25	"	"	"	"	"	4.18	236	1.42	38	1.74	56
7.....	0.23	"	"	"	"	"	3.83	207	1.36	35	1.64	51
8.....	0.23	"	"	"	"	"	3.31	166	1.32	33	1.60	48
9.....	0.23	"	"	"	"	"	3.45	177	1.30	32	1.54	45
10.....	0.23	"	"	"	"	" ^x	3.41	174	1.29	31	1.59	48
11.....	0.23	"	"	"	.....	10	3.51	182	1.26	30	1.60	48
12.....	0.21	"	"	"	.....	20	3.61	190	1.25	29	1.64	51
13.....	0.21	"	"	"	.....	40	3.69	196	1.25	29	1.59	48
14.....	0.21	"	"	"	.....	50	3.79	204	1.25	29	1.56	46
15.....	0.20	"	"	"	.....	60	3.94	216	1.25	29	1.52	44
16.....	0.17	"	"	"	.....	70	4.20	237	1.26	30	1.46	40
17.....	0.14	"	"	"	.....	80	4.20	237	1.28	31	1.41	38
18.....	0.10	"	"	"	.....	100	4.07	227	1.29	31	1.39	37
19.....	0.07	"	"	"	.....	150	3.99	220	1.31	32	1.35	34
20.....	0.03 ^x	"	"	"	.....	300	3.86	210	1.31	32	1.32	33
21.....	Dry	"	"	"	.....	500	3.71	198	1.31	32	1.32	33
22.....	"	"	"	"	.....	800	3.50	181	1.33	33	1.32	33
23.....	"	"	"	"	.....^b	1,300	3.34	169	1.34	34	1.33	33
24.....	"	"	"	"	.....	1,602 ^d	3.14	153	1.39	37	1.34	34
25.....	"	"	"	"	.....^b	1,692	2.46	103	1.47	41	1.34	34
26.....	"	"	"	"	.....	1,782	1.75	57	1.57	47	1.34	34
27.....	"	"	"	"	.....	1,872	1.70	54	1.67	52	1.34	34
28.....	"	"	"	"	.....	1,962	1.67	52	1.79	59	1.56	46
29.....	"	"	"	"	16.52	2,250	1.66	52	1.98	71	1.41	38
30.....	"	"	"	"	.....	1,900	1.61	49	2.16	83	4.53	265
31.....	"	"	"	"	.....	1,700	.....	.....	2.27	90	.....	.....

^d Actual measurement.^b Ice conditions; discharge estimated, March 11 to 23; discharge estimated, March 25 to April 2.^x Jan. 1 to 20; gauge heights due to seepage through ice.^{x-x} Creek frozen solid.

DAILY GAUGE HEIGHT AND DISCHARGE OF Notukeu creek near Vanguard, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	4.32	247	1.36	35.0	1.15	24.0	1.03	18.0	1.01	17.0	0.99	2.00
2....	5.11	316	1.35	34.0	1.13	23.0	1.03	18.0	1.01	17.0	0.99	2.00
3....	6.07	412	1.33	33.0	1.10	22.0	1.03	18.0	1.01	17.0	0.99	2.00
4....	6.81	495	1.33	33.0	1.12	23.0	1.02	17.5	1.01	17.0	0.99	2.00
5....	.....	1,001 ^e	1.27	30.0	1.11	22.0	1.02	17.5	1.01	17.0	0.99	2.00
6....	9.06	798	1.25	29.0	1.10	22.0	1.03	18.0	1.01	17.0	0.99	2.00
7....	7.41	568	1.23	28.0	1.08	20.0	1.04	18.5	0.92	12.6	0.99	2.00
8....	6.36	444	1.22	28.0	1.10	22.0	1.04	18.5	1.01	17.0	0.99	2.00
9....	8.74	750	1.22	28.0	1.11	22.0	1.02	17.5	1.01	17.0	0.97	1.90
10....	8.71	745	1.17	25.0	1.07	20.0	1.02	17.5	1.01	17.0	0.97	1.90
11....	7.01	519	1.13	23.0	1.05	19.0	1.03	18.0	1.01	17.0	0.97	1.90
12....	5.57	361	1.07	20.0	1.03	18.0	1.01	17.0	1.01	17.0	0.97	1.90
13....	4.19	236	1.10	22.0	1.03	18.0	1.03	18.0	1.01	17.0	0.97	1.90
14....	3.24	161	1.10	22.0	1.02	17.5	1.03	18.0	1.00 ^b	16.0	0.97	1.90
15....	2.34	95	1.10	22.0	1.00	16.5	1.03	18.0	1.00	15.0	0.97	1.90
16....	1.98	71	1.10	22.0	1.02	17.5	1.03	18.0	1.00	14.0	0.97	1.90
17....	1.81	61	1.10	22.0	1.06	19.5	1.03	18.0	1.00	13.0	0.97	1.90
18....	1.65	51	1.10	22.0	1.08	20.0	1.03	18.0	1.00	12.0	0.97	1.90
19....	1.79	59	1.10	22.0	1.08	20.0	1.03	18.0	1.00	11.0	0.98	2.20
20....	1.59	48	1.10	22.0	1.08	20.0	1.03	18.0	1.00	10.0	0.97	1.90
21....	1.53	44	1.10	22.0	1.05	19.0	1.02	17.5	1.00	9.0	0.97	1.60
22....	1.44	39	1.10	22.0	1.04	18.5	1.01	17.0	1.00	8.0	0.97	1.00
23....	1.37	36	1.08	20.0	1.02	17.5	1.01	17.0	1.00	7.0	0.95	0.50
24....	1.39	37	1.05	19.0	1.03	18.0	1.01	17.0	1.00	6.0	Dry	Nil ^x
25....	1.35	34	1.07	20.0	1.07	20.0	1.01	17.0	1.00	5.0	"	Nil ^x
26....	1.34	34	1.15	24.0	1.09	21.0	1.01	17.0	1.00	4.0	"	"
27....	1.30	32	1.15	24.0	1.08	20.0	1.01	17.0	1.00	3.0	"	"
28....	1.25	29	1.13	23.0	1.07	20.0	1.01	17.0	1.01	2.0	"	"
29....	1.64	51	1.10	22.0	1.05	19.0	1.01	17.0	0.99	2.0	"	"
30....	1.47	41	1.06	19.5	1.03	18.0	1.01	17.0	0.99	2.0	"	"
31....	1.45	40	1.07	20.0	.....	.....	1.01	17.0	.....	.....	" ^b	" ^x

^e Discharge estimated.^{b-b} Ice conditions; discharge estimated.^{x-x} Creek frozen solid; no discharge.

MONTHLY DISCHARGE of Notukeu creek near Vanguard, for 1916

(Drainage area 1,406 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January ^x	Nil	Nil	Nil	Nil	Nil	Nil
February	"	"	"	"	"	"
March ^x	2,250.0	10.0	588.00	0.418	0.48	36,155
April	1,600.0	49.0	260.00	0.185	0.21	15,471
May	90.0	29.0	41.00	0.029	0.03	2,521
June	265.0	33.0	55.00	0.039	0.04	3,273
July	1,001.0	29.0	253.00	0.180	0.21	15,556
August	35.0	19.0	24.00	0.017	0.02	1,476
September	24.0	16.5	19.00	0.014	0.02	1,184
October	18.5	17.0	17.60	0.013	0.02	1,082
November	17.0	2.0	11.90	0.008	0.01	708
December	2.2	0.0	1.36	0.001	0.00	84
The year	.....	.....	.....	.....	1.04	77,510

^x Creek frozen solid; no discharge, Jan. 1 to Mar. 10.

QU'APPELLE RIVER DRAINAGE BASIN

General Description

Qu'Appelle river rises in Township 23, Range 4, West of the 3rd Meridian, and flows eastward into the Assiniboine river in Township 28, Range 17, West of the 1st Meridian. These waters eventually find their way into Hudson's bay through the Red river, lake Winnipeg and Nelson river.

The chief tributaries of Qu'Appelle river are Moosejaw creek, Last Mountain lake, Wascana creek and Loon creek. Last Mountain is the largest lake in the basin, being some sixty miles long and from one to three miles wide.

The valley of the main stream is from two to three hundred feet deep, with a flat from one to three miles wide along the river. This flat is covered in many places with brush and the side hills are in many places well wooded. The bench lands above the river are mostly level prairie, much of which is now under cultivation.

The mean annual rainfall at Moosejaw is fourteen inches, at Regina fifteen inches, and at Indian Head nineteen inches. The streams are frozen during the winter months, and there is usually an abundant snowfall.

There are several irrigation and many industrial water rights in this basin.

The spring of 1916 was marked by exceptionally high water in Qu'Appelle river for a short period due to rapid melting of the snow cover on the drainage basin.

QU'APPELLE RIVER AT LUMSDEN

Location.—On NW. $\frac{1}{4}$ Sec. 33, Tp. 19, Rge. 21, W. 2nd Mer., at J. G. Miller's farm near Lumsden, Sask.

Records available.—May 12, 1911, to December 31, 1916.

Gauge.—Vertical staff; zero of gauge maintained at elevation of 85.35 feet during 1911-13; and at elevation of 85.16 feet during 1914-16.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Permanent, but debris on control affects gauge heights.

Discharge measurements.—By wading or from bridge.

Winter flow.—Affected by ice.

Observers.—J. G. Miller and W. J. Steele.

DISCHARGE MEASUREMENTS of Qu'Appelle river at Lumsden, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 11.....	F. R. Shenstone.....	10.4	3.98	0.13	1.88	0.53
Feb. 9.....	do.....	4.5	1.30	0.11	1.74	0.14
Mar. 11.....	do.....	4.2	1.28	0.04	1.56	0.06
Mar. 31.....	do.....	5.5	3.00	0.32	2.00	0.96
April 18.....	do.....	105.0	1,119.00	2.33	.....	2,617.00 _z
April 19.....	do.....	105.0	1,109.00	2.16	.....	2,401.00 _z
April 26.....	V. A. Newhall.....	84.0	1,304.00	1.74	23.38	2,332.00
May 22.....	F. R. Shenstone.....	27.0	209.00	1.41	7.15	294.00
June 14.....	do.....	27.0	194.00	1.31	6.66	256.00
July 21.....	J. R. Estey.....	26.0	140.00	0.67	4.56	94.00
Aug. 12.....	do.....	26.0	128.00	0.57	3.97	73.00 _p
Sept. 1.....	F. R. Shenstone.....	19.0	27.00	1.19	3.24	32.00
October 5.....	do.....	19.5	22.70	1.17	2.98	27.00
Nov. 3.....	do.....	26.0	35.60	1.04	3.37	37.00
Nov. 23.....	do.....	21.0	20.40	0.93	2.88	18.90 _i

_i Stream frozen over.

_z Measurements made at Craven, Sec. 23, Tp. 20, Rge. 21, W. 2nd Mer., because of flood conditions at Lumsden; and includes discharge of Boggy and Flying creeks.

_p Unfavourable conditions; velocity very low, area large.

DAILY GAUGE HEIGHT AND DISCHARGE of Qu'Appelle river at Lumsden, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	2.00 ^b	1.30	1.81	0.27	1.58	0.05	9.40	20 _g	18.31	1,540	6.59	247
2....	1.98	1.20	1.80	0.25	1.57	0.05	13.82	60	17.01	1,355	6.67	253
3....	1.96	1.10	1.78	0.24	1.58	0.05	14.35	100	16.02	1,225	6.75	259
4....	1.99	1.02	1.78	0.20	1.60	0.05	14.34	120	15.88	1,200	6.97	276
5....	1.95	0.95	1.77	0.15	1.61	0.05	14.26	140	15.18	1,110	7.11	288
6....	1.93	0.86	1.76	0.14	1.58	0.04	11.77	160	12.55	800	7.17	293
7....	1.92	0.82	1.75	0.13	1.55	0.03	11.23	180	12.73	820	7.15	291
8....	1.90	0.73	1.75	0.12	1.57	0.03	9.98	200	11.47	685	7.23	298
9....	1.90	0.65	1.74	0.14	1.56	0.03	9.09	300	10.48	580	7.22	297
10....	1.89	0.60	1.73	0.14	1.54	0.03	10.94	500	9.98	534	7.19	294
11....	1.87	0.53	1.74	0.14	1.54	0.06	12.44	900	9.95	532	6.96	276
12....	1.88	0.52	1.75	0.15	1.53	0.05	15.94	1,500	9.82	520	6.77	260
13....	1.86	0.45	1.73	0.15	1.50	0.04	17.74	1,600	9.66	505	6.70	255
14....	1.81	0.40	1.73	0.17	1.51	0.03	19.04	1,700	8.76	425	6.67	253
15....	1.77	0.38	1.72	0.21	1.50	0.04	19.69	1,800 _g	8.13	372	6.68	254
16....	1.72	0.37	1.71	0.24	1.50	0.05	20.94	1,940	7.83	347	6.67	253
17....	1.74	0.35	1.71	0.25	1.51	0.06	21.89	2,090	7.72	338	6.64	251
18....	1.76	0.35	1.70	0.25	1.53	0.08	22.62	2,205	7.68	334	6.62	249
19....	1.77	0.35	1.69	0.24	1.52	0.10	23.16	2,295	7.62	330	6.62	249
20....	1.79	0.33	1.70	0.23	1.54	0.13	23.38	2,330	7.50	320	6.59	247
21....	1.82	0.32	1.69	0.22	1.54	0.17	23.65	2,380	7.39	311	6.58	246
22....	1.84	0.31	1.67	0.21	1.53	0.20	23.88	2,413	7.18	293	6.58	246
23....	1.89	0.31	1.65	0.18	1.54	0.27	22.64	2,210	6.93	273	6.54	243
24....	1.91	0.32	1.63	0.15	1.56	0.32	23.84	2,408	6.87	269	6.50	240
25....	1.96	0.33	1.59	0.13	1.58	0.35	23.68	2,380	6.80	263	6.43	234
26....	1.92	0.32	1.57	0.12	1.60	0.36	23.38	2,332 ^d	6.84	266	6.32	226
27....	1.93	0.32	1.59	0.10	1.61	0.40	22.30	2,158	6.82	265	5.96	198
28....	1.90	0.30	1.58	0.08	1.59	0.42	20.91	1,935	6.80	263	5.43	156
29....	1.87	0.28	1.56	0.07	1.64	0.60	20.44	1,862	6.78	262	5.29	146
30....	1.82	0.27	.....	.....	1.75	0.80	19.00	1,640	6.62	249	5.32	148
31....	1.80	0.27	.....	.....	2.00 ^b	1.00	.....	.....	6.61	248	.....	.....

b-b Ice conditions; discharge determined from winter graph.

d Actual measurement.

g Ice going out; discharge estimated.



View showing Qu'Appelle river in flood at Lumsden, Saskatchewan, in April, 1916.
Taken on April 26, 1916, by V. A. Newhall.



Another view of flooding from Qu'Appelle river at Lumsden, in April, 1916.
Taken on April 26, 1916, by V. A. Newhall.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Qu'Appelle river at Lumsden, for 1916.—*Concluded.*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	5.31	147	4.20	72	3.24	34	3.05	29	3.59	44.0	2.85	13.0
2	5.40	154	4.09	66	3.16	32	3.08	30	3.55	43.0	2.81	12.5
3	5.34	149	4.12	68	3.10	30	3.18	32	3.50	41.0	2.79	12.0
4	5.19	138	4.12	68	3.04	29	3.22	33	3.49	41.0	2.82	11.3
5	5.08	130	4.05	64	3.08	30	2.98	27	3.48	40.0	2.84	10.8
6	5.31	147	4.04	64	3.06	29	3.17	32	3.49	41.0	2.80	10.4
7	5.38	152	3.90	57	3.08	30	3.22	33	3.45	40.0	2.79	10.0
8	5.30	146	3.90	57	3.10	30	3.22	33	3.40	38.0	2.76	9.7
9	5.22	140	4.04	64	3.11	30	3.27	34	3.39	38.0	2.73	9.4
10	5.22	140	4.01	62	3.51	41	3.27	34	3.24	34.0	2.72	9.0
11	5.34	149	4.04	64	3.58	44	3.18	32	.....	30.0e	2.69	8.5
12	5.14	134	3.96	60	3.46	40	3.08	30	2.95	26.0	2.67	8.0
13	5.00	124	3.83	54	3.45	40	3.02	28	2.87b	30.0	2.65	7.5
14	4.98	123	3.73	50	3.47	40	3.01	28	2.79	30.0	2.63	7.0
15	4.91	117	3.70	49	3.38	38	2.96	27	.....	30.0e	2.60	6.7
16	4.88	115	3.68	48	3.32	36	2.99	27	2.67	30.0	2.58	6.3
17	4.84	112	3.64	46	3.27	34	2.97	27	2.64	29.0	2.61	5.9
18	4.74	106	3.59	44	3.16	32	2.92	26	2.66	28.0	2.64	5.5
19	4.71	104	3.55	43	3.04	29	2.90	25	2.68	27.0	2.63	5.2
20	4.63	98	3.58	44	3.22	33	2.90	25	2.65	25.0	2.60	5.0
21	4.59	96	3.60	45	3.13	31	2.99	27	2.67	23.0	2.61	4.6
22	4.50	90	3.50	41	3.20	33	3.03	28	.....	21.0e	2.58	4.2
23	4.49	89	3.43	39	3.22	33	3.06	29	2.88	18.9	2.56	3.9
24	4.42	84	3.46	40	3.06	29	3.14	31	2.86	17.7	2.53	3.4
25	4.33	79	3.42	39	3.09	30	3.34	36	2.92	16.8	2.50	3.3
26	4.21	73	3.42	39	3.19	32	3.54	43	2.96	16.0	2.49	3.0
27	4.12	68	3.43	39	3.32	36	3.64	46	2.98	15.3	2.49	3.0
28	4.21	73	3.42	39	3.24	34	3.59	44	2.93	14.6	2.46	2.9
29	4.25	75	3.36	37	3.17	32	3.63	46	2.89	14.0	2.36	2.8
30	4.32	79	3.28	35	3.13	31	3.65	47	2.87	13.7	2.39	2.5
31	4.31	78	3.24	34	.....	.....	3.61	45	.....	.....	2.42b	2.4

b-b Ice conditions; discharge determined from winter graph.
Discharge estimated.

MONTHLY DISCHARGE of Qu'Appelle river at Lumsden, for 1916

(Drainage area 6,160 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January	1.30	0.27	0.54	0.00009	0.00010	33
February	0.27	0.27	0.18	0.00003	0.00003	10
March	1.00	0.03	0.19	0.00003	0.00003	12
April	2,413.00	20.00	1,395.00	0.22600	0.25000	82,988
May	1,540.00	248.00	543.00	0.08800	0.01000	33,388
June	298.00	146.00	248.00	0.04000	0.04000	14,757
July	154.00	68.00	113.00	0.01800	0.02000	6,948
August	72.00	34.00	51.00	0.00800	0.00900	3,136
September	44.00	29.00	33.00	0.00500	0.00600	1,964
October	47.00	25.00	33.00	0.00500	0.00600	2,029
November	44.00	13.70	28.00	0.00500	0.00600	1,666
December	13.00	2.40	6.80	0.00100	0.00100	418
The year	.....	.....	.....	.....	0.34816	147,349

MEAN MONTHLY DISCHARGE in Second-feet of Qu'Appelle river at Lumsden

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		15.40	23.60	9.16	6.00	9.30	33.00	16.10	973
November.....		3.72	16.60	7.47	4.40	3.80	28.00	10.70	621
December.....		2.77	2.71	3.80	2.40	2.10	6.80	3.40	211
January.....		0.73	1.09	1.14	0.77	0.54	.....	0.85	173
February.....		0.36	2.49	0.01	0.06	0.18	.....	0.82	34
March.....		15.80	60.90	1.85	0.08	0.19	.....	15.80	969
April.....		395.00	428.00	86.00	9.00	1,395.00	.....	463.00	27,523
May.....	83.90a	523.00	82.00	33.00	11.20	543.00	.....	238.00	14,661
June.....	133.00	158.00	46.40	24.00	7.60	248.00	.....	103.00	6,119
July.....	42.60	86.40	46.80	19.80	5.90	113.00	.....	52.00	3,223
August.....	12.90	34.10	31.20	7.50	2.60	51.00	.....	23.00	1,428
September.....	32.40	29.00	15.40	5.40	3.70	33.00	.....	20.00	1,176
Total in Acre-ft.	16,582	76,400	46,142	11,999	3,254	144,163	.....	.....	57,111

a 12-31.

MOOSEJAW CREEK DRAINAGE BASIN

General Description

Moosejaw creek rises in the Yellowgrass marsh, which lies in Townships 9 and 10, Range 17, West of the 2nd Meridian, and flows in a northerly and westerly direction until it reaches the city of Moosejaw, where it is joined by Thunder creek. From Moosejaw it follows an easterly and northerly course, finally emptying into the Qu'Appelle river near Buffalo Pound lake. From the headwaters to the city of Moosejaw the drainage area is estimated at about 1,830 square miles. This area is almost entirely devoid of tree growth, except in the vicinity of Moosejaw, where the valley is lined with brush.

Throughout its entire length the creek flows in a very crooked but well defined channel. The upper portion of the valley is small, being merely a depression, but it gradually increases in size until at Drinkwater it is about thirty feet deep and at Moosejaw eighty feet deep. The fall in the creek is very small, and particularly so between Drinkwater and Moosejaw, where the total fall is only 67.5 feet or an average of 2.3 feet per mile of valley.

The Canadian Pacific Railway Company has dams at Milestone, Rouleau, Drinkwater, two at Moosejaw and one at Pasqua. There is also a municipality dam in Section 19, Township 15, Range 24, West of the 2nd Meridian, which supplies water to the neighbourhood during periods when there is no flow in the creek. In 1913 the Canadian Pacific Railway Company constructed a new dam to replace their old dam in Moosejaw.

The spring of 1916 was marked by exceptionally high water in Moosejaw creek for a short period, due to the rapid melting of the snow cover on the basin.

MOOSEJAW CREEK NEAR LANG

Location.—On traffic bridge on road allowance, east of the NE. $\frac{1}{4}$ Sec. 24, Tp. 11, Rge. 19, W. 2nd Mer., four miles west of the village of Lang.

Records available.—From June 21, 1911, to October 31, 1916.

Gauge.—Vertical staff. Zero elevation of gauge was maintained at 94.80 feet during 1911, 95.07 feet during 1912-13, 95.04 feet during 1914-16.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Permanent.

Discharge measurements.—From bridge or by wading.

Winter flow.—No winter observations have been taken.

Observer.—Miss Irene Irvine.

MONTHLY DISCHARGE of Qu'Appelle river at Lumsden, for 1912

(Drainage area 6,160 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	1.97	0.33	0.727	0.0001	0.0001	45
February.....	40.40	0.33	0.355	0.0001	0.0001	20
March.....	166.00	0.26	15.800	0.0020	0.0020	971
April.....	867.00	94.00	395.000	0.0640	0.0710	23,504
May.....	884.00	81.00	523.000	0.0840	0.0870	32,158
June.....	308.00	68.00	158.000	0.0260	0.0290	9,402
July.....	128.00	55.00	86.400	0.0140	0.0160	5,312
August.....	48.00	27.00	34.100	0.0060	0.0070	2,097
September.....	37.00	21.00	29.000	0.0050	0.0060	1,726
October.....	30.00	19.00	23.600	0.0040	0.0050	1,451
November.....	24.00	2.98	16.600	0.0030	0.0030	988
December.....	3.24	2.36	2.710	0.0004	0.0010	167
The year.....					0.2370	77,841

This table is inserted in this report to correct a table which was published on page 425 of the report for 1912. The records for the month of June and the total run-off depth in inches were incorrect as then published.

MONTHLY DISCHARGE of Qu'Appelle river at Lumsden, for 1913

(Drainage area 6,160 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	3.4	0.0	1.09	0.0002	0.0002	67
February.....	3.7	0.6	2.49	0.0004	0.0004	138
March.....	163.0	0.0	60.90	0.0090	0.0100	3,745
April.....	807.0	101.0	428.00	0.0700	0.0800	25,468
May.....	107.0	62.0	82.00	0.0130	0.0140	5,042
June.....	79.0	25.0	46.40	0.0070	0.0080	2,761
July.....	83.0	30.0	46.80	0.0070	0.0080	2,878
August.....	46.0	21.0	31.20	0.0050	0.0060	1,918
September.....	25.0	8.0	15.40	0.0020	0.0020	916
October.....	13.1	5.0	9.16	0.0010	0.0010	563
November.....	9.0	6.1	7.47	0.0010	0.0010	444
December.....	6.9	2.2	3.80	0.0006	0.0010	234
The year.....					0.1320	44,174

This table is inserted in this report to correct a table which was published on page 383 of the report for 1913. The records for the month of January and the totals were incorrect as then published.

SESSIONAL PAPER No. 25b

DISCHARGE MEASUREMENTS of Moosejaw creek near Lang, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 16.....	F. R. Shenstone.....	35.5	59.6	0.06	1.97	3.62
June 8.....	do.....				2.05	4.00e

e Discharge estimated from field inspection.

DAILY GAUGE HEIGHT AND DISCHARGE of Moosejaw creek near Lang, for 1916

DAY	April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			3.42	10.0	1.66	2.4
2.....			3.45	10.2	1.63	2.3
3.....			3.30	9.5	1.61	2.3
4.....			3.10	8.6	1.60	2.2
5.....			2.50	6.0	1.59	2.2
6.....			2.78	7.2	1.95	3.6
7.....			2.66	6.7	2.02	3.0
8.....			2.52	6.1	2.05	4.0
9.....			2.37	5.4	2.00	3.8
10.....			2.28	5.0	1.95	3.6
11.....			1.96	3.6	1.90	3.4
12.....			2.00	3.8	1.86	3.2
13.....			2.00	3.8	1.80	2.9
14.....			2.05	4.0	1.77	2.8
15.....			2.00	3.8	1.75	2.7
16.....			1.90	3.4	1.70	2.5
17.....			1.86	3.2	1.67	2.4
18.....			1.80	3.1	1.65	2.4
19.....			1.77	2.8	1.61	2.3
20.....			1.73	2.7	1.60	2.2
21.....			1.70	2.5	1.59	2.2
22.....			1.69	2.5	1.58	2.2
23.....			1.65	2.4	1.57	2.2
24.....			1.70	2.5	1.60	2.2
25.....	4.14	13.2	1.75	2.7	1.59	2.2
26.....	4.45	14.6				
27.....			4.15	13.3	1.84	3.1
28.....			3.85	11.9	1.82	3.0
29.....			3.50	10.4	1.80	2.9
30.....			3.30	9.5	1.78	2.9
31.....			3.40	10.0	1.75	2.7
			1.70	2.5		

g Stream started to break up on April 3.

DAILY GAUGE HEIGHT AND DISCHARGE of Moosejaw creek near Lang, for 1916—*Concluded*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	1.71	2.60	1.45	1.83	0.78	0.68	0.36	0.47
2.....	1.70	2.50	1.43	1.78	0.75	0.67	0.34	0.47
3.....	1.70	2.50	1.40	1.71	0.72	0.65	0.33	0.46
4.....	1.70	2.50	1.37	1.64	0.68	0.63	0.37	0.48
5.....	1.69	2.50	1.37	1.64	0.60	0.58	0.37	0.48
6.....	1.69	2.50	1.40	1.71	0.57	0.56	0.39	0.49
7.....	1.66	2.40	1.36	1.62	0.55	0.55	0.42	0.50
8.....	1.64	2.40	1.36	1.62	0.50	0.53	0.45	0.45
9.....	1.62	2.30	1.47	1.88	0.48	0.52	0.46	0.51
10.....	1.60	2.20	1.54	2.10	0.55	0.55	0.44	0.51
11.....	1.56	2.10	1.51	1.99	0.53	0.54	0.42	0.50
12.....	1.50	1.96	1.47	1.88	0.51	0.53	0.40	0.49
13.....	1.45	1.83	1.41	1.73	0.58	0.59	0.43	0.50
14.....	1.42	1.76	1.40	1.71	0.56	0.56	0.41	0.49
15.....	1.40	1.71	1.38	1.67	0.54	0.55	0.40	0.49
16.....	1.37	1.64	1.36	1.62	0.58	0.57	0.39	0.49
17.....	1.35	1.60	1.30	1.50	0.56	0.56	0.41	0.49
18.....	1.47	1.88	1.25	1.40	0.54	0.55	0.39	0.49
19.....	1.45	1.83	1.15	1.22	0.52	0.54	0.38	0.48
20.....	1.43	1.78	1.09	1.11	0.50	0.53	0.36	0.47
21.....	1.42	1.76	1.07	1.08	0.48	0.52	0.34	0.46
22.....	1.40	1.71	1.06	1.07	0.45	0.50	0.38	0.48
23.....	1.39	1.69	1.05	1.05	0.43	0.50	0.40	0.49
24.....	1.36	1.62	1.00	0.98	0.41	0.49	0.42	0.50
25.....	1.40	1.71	0.96	0.92	0.41	0.49	0.44	0.51
26.....	1.40	1.71	0.94	0.89	0.41	0.49	0.42	0.50
27.....	1.39	1.69	0.92	0.86	0.41	0.49	0.40	0.49
28.....	1.42	1.76	0.90	0.83	0.41	0.49	0.38	0.48
29.....	1.40	1.71	0.87	0.79	0.40	0.49	0.36	0.47
30.....	1.39	1.69	0.85	0.76	0.38	0.48	0.35	0.47
31.....	1.37	1.64	0.80	0.70			0.34	0.47

MONTHLY DISCHARGE of Moosejaw creek near Lang, for 1916

(Drainage area 189 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April (24-30).....	14.60	9.50	11.90	0.063	0.016	165
May.....	10.20	2.40	4.50	0.024	0.030	277
June.....	4.00	2.20	2.70	0.014	0.020	161
July.....	2.60	1.62	1.97	0.010	0.010	121
August.....	2.10	0.70	1.39	0.007	0.008	85
September.....	0.68	0.48	0.55	0.003	0.003	33
October.....	0.51	0.45	0.48	0.003	0.003	30
The period.....					0.090	872

SESSIONAL PAPER No. 25a

MEAN MONTHLY DISCHARGE in Second-feet of Moosejaw creek near Lang

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		3.90b	Nil	Nil	Nil	Nil	0.48	0.10	6
November			"	"	"	"			
December			"	"	"	"			
January			"	"	"	"			
February			"	"	"	"			
March				d	"	"			
April		38.00	5.70c	31.00	"	11.90f		23.00	1,365
May		51.00	0.43	3.10	"	4.50		11.80	730
June		1.46a	22.00	Nil	0.80	2.70		5.10	301
July		3.90	5.30	"	0.11	1.97		1.88	116
August		4.90	0.95	"	Nil	1.39		1.21	74
September		2.30	0.07	"	"	0.55		0.49	29
Total in acre-feet	705	7,310	206	2,091	Nil	842			2,621

a 21-30.

b 1-28.

c 15-30.

d Spring freshet, but no definite records of it.

f 24-30.

MOOSEJAW CREEK AT MCCARTHY'S FARM

Location.—On the NW. $\frac{1}{4}$ Sec. 16, Tp. 16, Rge. 26, W. 2nd Mer., about three miles south of Moosejaw.

Records available.—April 7, 1910, to December 31, 1915.

Gauge.—Vertical staff; zero elevation maintained at 83.03 feet during 1910-11; zero elevation maintained at 82.99 feet during 1912-13; zero elevation maintained at 81.99 feet during 1914-16.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Permanent.

Discharge measurements.—With current-meter from bridge or by wading.

Observer.—Miss Sadie McCarthy.

Remarks.—Serious floods resulted from the melting snows in Moosejaw creek valley in the spring of 1916. The Canadian Pacific railway dam at Moosejaw was broken and serious inconvenience was experienced by the flooding of houses in the low flats.

DISCHARGE MEASUREMENTS of Moosejaw creek at McCarthy's farm, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Feb. 11	F. R. Shenstone				Dry	Nil
Mar. 30	J. C. Keith	33	128.0	2.49	6.11	320.00
April 3	F. R. Shenstone	52	175.0	1.84	5.87	322.00
April 10	J. C. Keith	88	590.0	1.86	11.51	1,097.00
April 19	V. A. Newhall	104	1,244.0	2.13	16.73	2,648.00
April 20	do	103	1,193.0	2.10	15.91	2,508.00
April 27	do	103	673.0	1.97	10.78	1,325.00
May 15	F. R. Shenstone	32	86.0	1.02	3.29	87.00
June 7	do	32	73.0	0.57	2.85	42.00
July 8	do	26	11.5	1.34	2.60	15.40
July 31	J. R. Estey	20	6.6	0.30	2.15	1.98
Aug. 18	do	19	7.2	0.14	2.11	0.96
Sept. 2	F. R. Shenstone	16	2.2	0.17	2.07	0.36
Oct. 6	do	20	4.6	0.48	2.15	2.24
Nov. 4	do	23	8.4	1.88	2.31	7.40
Nov. 24	do	18	5.7	0.66	2.19	3.80
Dec. 18	do	6	1.8	0.34	2.28	0.62

DAILY GAUGE HEIGHT AND DISCHARGE of Moosejaw creek at McCarthy's farm, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	Dry	Nil	Dry	Nil	0.60	Nil	6.63	340	8.05	770.0	2.32	11.0
2....	"	"	"	"	0.45	"	6.51	340	7.33	631.0	2.52	21.0
3....	"	"	"	"	0.34	"	6.09	350	6.59	504.0	2.89	45.0
4....	"	"	"	"	0.20	"	4.93	400	5.79	384.0	2.91	47.0
5....	"	"	"	"	0.12	"	4.41	450	5.25	302.0	2.95	50.0
6....	"	"	"	"	0.08	"	3.89	500	4.84	247.0	3.01	54.0
7....	"	"	"	"	0.10	"	6.31	800	4.54	208.0	2.87	45.0
8....	"	"	"	"	1.38	"	9.01	900	4.17	163.0	2.67	30.0
9....	"	"	"	"	1.50	"	10.93 _g	1,000	3.95	140.0	2.77	37.0
10....	"	"	"	"	1.70	"	11.53	1,093	3.77	122.0	2.95	50.0
11....	"	"	"	"	1.78	"	11.61	1,107	3.67	112.0	3.00	53.0
12....	"	"	"	"	1.87	"	12.19	1,218	3.58	103.0	3.03	55.0
13....	"	"	"	"	1.96	"	13.81	1,562	3.46	91.0	3.09	59.0
14....	"	"	"	"	1.96	"	17.06	2,325	3.37	82.0	3.09	59.0
15....	"	"	1.08	"	1.96	"	18.95	2,798	3.28	73.0	3.10	60.0
16....	"	"	1.14 _x	"	1.96	"	19.05	2,822	3.21	68.0	3.07	58.0
17....	"	"	1.17	"	1.98	"	18.71	2,738	3.11	61.0	3.00	53.0
18....	"	"	1.18	"	1.99	"	17.97	2,958	3.00	53.0	2.95	50.0
19....	"	"	1.19	"	2.07	"	16.76	2,671	2.91	47.0	2.87	44.0
20....	"	"	1.23	"	2.15	"	15.76	2,440	2.75	36.0	2.77	37.0
21....	"	"	1.27	"	2.15	"	14.73	2,204	2.64	28.0	2.73	34.0
22....	"	"	1.27	"	2.15	"	13.69	1,972	2.53	22.0	2.70	32.0
23....	"	"	1.22	"	2.15	"	12.73	1,759	2.43	16.5	2.67	30.0
24....	"	"	1.19	"	2.15	"	12.39	1,683	2.36	13.0	2.61	27.0
25....	"	"	1.12	"	2.13	"	11.87	1,568	2.37	13.5	2.57	24.0
26....	"	"	1.07	"	2.14 _x	"	11.28	1,434	2.44	17.0	2.49	19.5
27....	"	"	1.00	"	2.60	10	10.67	1,299	2.39	14.5	2.55	23.0
28....	"	"	0.88	"	3.95 _g	50	10.09	1,178	2.35	12.5	2.59	25.0
29....	"	"	0.74	"	4.86	100	9.47	1,054	2.33	11.5	2.65	29.0
30....	"	"	.....	.....	5.99	320	8.87	934	2.34	12.0	2.66	30.0
31....	"	"	.....	.....	6.67	340	.....	.....	2.34	12.0	.....	.....

x-x Water standing on ice.

g-g Ice going out; discharge estimated. Maximum gauge height 19.11 on April 15.

SESSIONAL PAPER No. 25a

DAILY GAUGE HEIGHT AND DISCHARGE of Moosejaw creek at McCarthy's farm, for 1916
—Concluded

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	2.62	27.0	2.16	4.4	2.10	2.00	2.10	2.00	2.33	11.5	2.16	4.40
2....	2.58	25.0	2.15	4.0	2.07	1.40	2.09	1.80	2.32	11.0	2.16	4.40
3....	2.52	21.0	2.15	4.0	2.07	1.40	2.10	2.00	2.32	11.0	2.15	4.00
4....	2.48	19.0	2.14	3.6	2.07	1.40	2.10	2.00	2.31	10.5	2.14	3.60
5....	2.45	17.5	2.14	3.6	2.08	1.60	2.13	3.20	2.33	11.5	2.13	3.20
6....	2.41	15.5	2.12	2.8	2.08	1.60	2.14	3.60	2.36	13.0	2.12	2.80
7....	2.47	18.5	2.11	2.4	2.09	1.80	2.18	5.20	2.36	13.0	2.10	2.00
8....	2.47	18.5	2.11	2.4	2.09	1.80	2.23	7.20	2.34	12.0	2.11	2.40
9....	2.47	18.5	2.11	2.4	2.10	2.00	2.22	6.80	2.36	13.0	2.12	2.80
10....	2.41	17.0	2.11	2.4	2.10	2.00	2.23	7.20	2.38 ^b	14.0	2.14	3.60
11....	2.41	15.5	2.11	2.4	2.11	2.40	2.23	7.20	2.40	15.0	2.14	3.60
12....	2.37	13.5	2.11	2.4	2.11	2.40	2.22	6.80	2.42	16.0	2.15	4.00
13....	2.32	11.0	2.12	2.8	2.11	2.40	2.22	6.80	2.42	16.0	2.12	2.80
14....	2.29	9.6	2.11	2.4	2.11	2.40	2.22	6.80	2.40	15.0	2.12	2.80
15....	2.28	9.2	2.11	2.4	2.11	2.40	2.27	8.80	2.40	15.0	2.12	2.80
16....	2.27	8.8	2.10	2.0	2.11	2.40	.....	13.40 ^a	2.40	15.0	2.16	4.40
17....	2.26	8.4	2.10	2.0	2.11	2.40	2.46	18.00	2.40	15.0	2.22	2.50
18....	2.27	8.8	2.10	2.0	2.11	2.40	2.64	28.00	2.39	14.5	2.29	0.62
19....	2.25	8.0	2.11	2.4	2.11	2.40	2.65	29.00	2.38	14.0	2.29	0.59
20....	2.25	8.0	2.10	2.0	2.10	2.00	2.56	24.00	2.37	13.5	2.30	0.56
21....	2.24	7.6	2.10	2.0	2.09	1.80	2.53	22.00	2.20	6.0	2.30	0.53
22....	2.23	7.2	2.10	2.0	2.09	1.80	2.49	19.50	2.20	6.0	2.30	0.50
23....	2.21	6.4	2.10	2.0	2.08	1.60	2.45	17.50	2.19	5.6	2.30	0.47
24....	2.19	5.6	2.11	2.4	2.08	1.60	2.44	17.00	2.18	5.2	2.29	0.44
25....	2.18	5.2	2.11	2.4	2.08	1.60	2.40	15.00	2.18	5.2	2.29	0.41
26....	2.18	5.2	2.11	2.4	2.09	1.80	2.38	14.00	2.18	5.2	2.29	0.38
27....	2.17	4.8	2.11	2.4	2.10	2.00	2.38	14.00	2.18	5.2	2.28	0.35
28....	2.17	4.8	2.11	2.4	2.11	2.40	2.37	13.50	2.17	4.8	2.27	0.32
29....	2.17	4.8	2.10	2.0	2.13	3.20	2.38	14.00	2.16	4.4	2.25	0.29
30....	2.17	4.8	2.10	2.0	2.12	2.80	2.38	14.00	2.16	4.4	2.21	0.26
31....	2.16	4.4	2.10	2.0	.....	.....	2.36	13.00	.....	.....	2.15 ^b	0.25

^a Discharge estimated.^{b-b} Ice conditions.

MONTHLY DISCHARGE of Moosejaw creek at McCarthy's farm, for 1916

(Drainage area 1,719 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	0.0	0.00	0.0	0.000	0.000	.....
February.....	0.0	0.00	0.0	0.000	0.000	.....
March.....	340.0	Nil	26.0	0.015	0.017	1,599
April.....	2,958.0	340.00	1,463.0	0.851	0.950	87,034
May.....	770.0	11.50	142.0	0.083	0.090	8,731
June.....	60.0	11.00	40.0	0.023	0.020	2,380
July.....	27.0	4.40	11.6	0.007	0.008	713
August.....	44.0	2.00	2.5	0.001	0.001	154
September.....	3.2	1.40	2.0	0.001	0.001	119
October.....	29.0	1.80	11.7	0.007	0.008	719
November.....	16.0	4.40	10.7	0.006	0.007	637
December.....	4.4	0.25	2.0	0.001	0.001	123
The year.....	.....	.....	.....	.....	1.103	102,209

MEAN MONTHLY DISCHARGE in Second-feet of Moosejaw creek at McCarthy's Farm

MONTH	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October		Nil	11.50	1.93	0.20	Nil	Nil	11.70	3.60	222
November			4.20	1.32	0.38	2.40	"	10.70	3.20	188
December			0.55	0.05	0.10	0.34	"	2.00	0.51	31
January			0.04	Nil	Nil	Nil	"		0.01	1
February			Nil	"	"	"	"		Nil	Nil
March		32.00 ^b	"	"	9.10	"	26.00		8.80	539
April	6.80 ^a	188.00	257.00 ^d	87.00 ^f	73.00	1.47	1,463.00		431.00	25,663
May	29.00	38.00	521.00	6.40	5.60	0.41	142.00		106.00	6,522
June	23.00	71.00	49.00	0.98	3.40	0.28	40.00		27.00	1,593
July	1.18	2.80	24.00	12.10	0.43	0.13	11.60		7.50	459
August	Nil	0.21	2.90	0.64	Nil	Nil	2.50		0.89	55
September	"	0.08	0.94	0.12	"	"	2.00		0.45	27
Total in acre-feet	3,547	26,151	50,923	5,242	5,515	304	100,730			35,300

^a 7-30.^b 19-31.^c Not sufficient data to compute discharge.^d 5-30.^f 9-30.

SANDY CREEK NEAR CARON

Location.—On the SE. $\frac{1}{4}$ Sec. 29, Tp. 17, Rge. 29, W. 2nd Mer.*Records available.*—August 1 to October 7, 1916.*Gauge.*—Vertical staff; zero maintained at elevation of weir crest since establishment.*Discharge measurements.*—From thirty-inch trapezoidal weir. Daily observations of head taken by observer.*Observer.*—James Grazier.*Remarks.*—One discharge measurement only in 1916. Observations were furnished gratis by Mr. Grazier, an employee of the city of Moosejaw.

DISCHARGE MEASUREMENTS of Sandy creek near Caron, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Sept. 11	F. R. Shenstone				0.16	0.538 ^w

^w Discharge determined by using a 30-inch weir.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Sandy creek near Caron, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	0.140	0.42	0.100	0.28	0.100	0.28	4.60	.....	0.47	2.70	0.45	2.50
2....	0.135	0.41	0.100	0.28	0.100	0.28	4.60	.....	0.47	2.70	0.44	2.40
3....	0.135	0.41	0.100	0.28	0.100	0.28	4.60	.....	0.46	2.60	0.42	2.30
4....	0.130	0.40	0.100	0.28	0.100	0.28	3.50	.....	0.46	2.60	0.39	2.00
5....	0.130	0.40	0.100	0.28	0.100	0.28	2.70	.....	0.45	2.50	0.41	2.20
6....	0.130	0.40	0.100	0.28	0.100	0.28	2.00	.....	0.45	2.50	0.45	2.50
7....	0.120	0.38	0.100	0.28	0.100	0.28	1.60	.....	0.43	2.40	0.47	2.70
8....	0.130	0.40	0.100	0.28	0.100	0.28	1.50	.....	0.43	2.40	0.47	2.70
9....	0.120	0.38	0.100	0.28	0.100	0.28	1.50	.....	0.42	2.30	0.47	2.70
10....	0.110	0.32	0.100	0.28	0.100	0.28	1.50	.....	0.40	2.10	0.47	2.70
11....	0.100	0.28	0.100	0.28	0.150	0.48	1.00	.....	0.40	2.10	0.45	2.50
12....	0.100	0.28	0.100	0.28	0.200	0.75	1.00	.....	0.40	2.10	0.43	2.40
13....	0.100	0.28	0.100	0.28	0.170	0.58	1.60	.....	0.40	2.10	0.42	2.30
14....	0.100	0.28	0.100	0.28	0.150	0.48	2.00	.....	0.40	2.10	0.39	2.00
15....	0.100	0.28	0.100	0.28	0.140	0.42	1.50	.....	0.39	2.00	0.38	1.98
16....	0.100	0.28	0.100	0.28	0.130	0.40	1.20	.....	0.39	2.00	0.36	1.85
17....	0.100	0.28	0.100	0.28	0.110	0.32	1.20	.....	0.39	2.00	0.35	1.78
18....	0.140	0.42	0.100	0.28	0.110	0.32	1.00	.....	0.38	1.98	0.34	1.70
19....	0.130	0.40	0.100	0.28	0.180	0.62	1.00	.....	0.38	1.98	0.33	1.62
20....	0.130	0.40	0.100	0.28	0.200	0.75	1.00	.....	0.36	1.85	0.33	1.62
21....	0.120	0.38	0.110	0.32	0.180	0.62	1.00	.....	0.36	1.85	0.32	1.55
22....	0.100	0.28	0.140	0.42	0.150	0.48	1.00	.....	0.35	1.78	0.36	1.85
23....	0.100	0.28	0.140	0.42	0.150	0.48	1.00	.....	0.34	1.70	0.42	2.30
24....	0.100	0.28	0.140	0.42	0.150	0.48	1.00	.....	0.34	1.70	0.40	2.10
25....	0.100	0.28	0.140	0.42	0.150	0.48	0.80	.....	0.45	2.50	0.40	2.10
26....	0.100	0.28	0.150	0.48	0.150	0.48	0.70	5.0	0.49	2.90	0.39	2.00
27....	0.100	0.28	0.150	0.48	0.200	0.75	0.50	3.0	0.52	3.20	0.37	1.92
28....	0.100	0.28	0.140	0.42	0.300	1.40	0.50	3.0	0.52	3.20	0.36	1.85
29....	0.100	0.28	0.120	0.38	0.400	2.10	0.50	3.0	0.49	2.90	0.38	1.98
30....	0.100	0.28	.....	.....	6.000	.....	0.47	2.7	0.48	2.80	0.38	1.98
31....	0.100	0.28	.....	.....	5.600	.....	.....	.....	0.46	2.60	.....	.....

No data available to compute discharge during flood period, March 30 to April 25.

DAILY GAUGE HEIGHT AND DISCHARGE of Sandy creek near Caron, for 1916.—*Concluded.*

DAY	July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	0.37	1.92	0.25	1.05	0.13	0.40	0.22	0.85
2.....	0.36	1.85	0.25	1.05	0.12	0.38	0.22	0.85
3.....	0.45	2.50	0.24	1.00	0.12	0.38	0.21	0.80
4.....	0.41	2.20	0.24	1.00	0.13	0.40	0.23	0.92
5.....	0.39	2.00	0.23	0.92	0.14	0.42	0.28	1.25
6.....	0.42	2.30	0.23	0.92	0.14	0.42	0.30	1.40
7.....	0.50	3.00	0.24	1.00	0.14	0.42	0.32	1.55
8.....	0.55	3.40	0.24	1.00	0.13	0.40	.....	.....
9.....	0.53	3.20	0.17	0.58	0.14	0.42	.....	.....
10.....	0.50	3.00	0.17	0.58	0.14	0.42	.....	.....
11.....	0.50	3.00	0.16	0.52	0.16	0.52	.....	.....
12.....	0.48	2.80	0.15	0.48	0.16	0.52	.....	.....
13.....	0.45	2.50	0.15	0.48	0.17	0.58	.....	.....
14.....	0.40	2.10	0.14	0.42	0.18	0.62	.....	.....
15.....	0.38	1.98	0.13	0.40	0.18	0.62	.....	.....
16.....	0.36	1.85	0.13	0.40	0.20	0.75	.....	.....
17.....	0.34	1.70	0.12	0.38	0.20	0.75	.....	.....
18.....	0.32	1.55	0.12	0.38	0.20	0.75	.....	.....
19.....	0.30	1.40	0.11	0.32	0.18	0.62	.....	.....
20.....	0.29	1.32	0.11	0.32	0.18	0.62	.....	.....
21.....	0.28	1.25	0.11	0.32	0.18	0.62	.....	.....
22.....	0.27	1.18	0.10	0.28	0.18	0.62	.....	.....
23.....	0.26	1.12	0.10	0.28	0.18	0.62	.....	.....
24.....	0.25	1.05	0.10	0.28	0.18	0.62	.....	.....
25.....	0.25	1.05	0.12	0.38	0.18	0.62	.....	.....
26.....	0.27	1.18	0.13	0.40	0.22	0.85	.....	.....
27.....	0.27	1.18	0.12	0.38	0.25	1.05	.....	.....
28.....	0.29	1.32	0.12	0.38	0.24	1.00	.....	.....
29.....	0.28	1.25	0.12	0.38	0.23	0.92	.....	.....
30.....	0.27	1.18	0.12	0.38	0.22	0.85	.....	.....
31.....	0.26	1.12	0.12	0.38	.....	.....	.....	.....

MONTHLY DISCHARGE of Sandy creek near Caron, for 1916

(Drainage area 92 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	0.42	0.28	0.33	0.004	0.00	20
February.....	0.48	0.28	0.32	0.003	0.00	18
March (1-29).....	2.10	0.28	0.52	0.006	0.01	30
April (26-30).....	5.00	2.70	3.30	0.036	0.01	33
May.....	3.20	1.70	2.30	0.025	0.03	141
June.....	2.70	1.55	2.10	0.023	0.03	125
July.....	3.40	1.05	1.69	0.018	0.02	104
August.....	1.05	0.28	0.55	0.006	0.01	34
September.....	1.05	0.38	0.61	0.007	0.01	36
October (1-7).....	1.55	0.80	1.09	0.012	0.00	15
The period.....	.....	.....	.....	.....	0.12	556

SESSIONAL PAPER No. 25B

SPRING (MILE 13) CREEK NEAR CARON

Location.—On the NE. $\frac{1}{4}$ Sec. 17, Tp. 17, Rge. 28, W. 2nd Mer.

Records available.—August 17 to December 31, 1916.

Gauge.—Vertical staff set above weir; zero elevation of gauge maintained at level of crest of weir.

Bench-mark.—None.

Channel.—Not likely to shift.

Discharge measurements.—Made with permanent six-inch weir, with current-meter by wading or from C.P.R. culvert.

Observer.—D. Weymss.

DISCHARGE MEASUREMENTS of Spring (Mile 13) creek near Caron, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Feb. 17.....	F. R. Shenstone.....	.....	.....	.....	.....	0.02e
Mar. 16.....	do.....	.....	.....	.....	.....	Nil
April 7.....	do.....	.....	.....	.....	.....	0.81w
July 29.....	J. R. Estey.....	.....	.....	.....	.....	0.02e
Aug. 17.....	do.....	.....	.....	.....	.....	Nil
Nov. 4.....	F. R. Shenstone.....	.....	.....	.....	.....	0.21w

w Weir measurement.

e Discharge estimated from field inspection.

DAILY GAUGE HEIGHT AND DISCHARGE of Spring (Mile 13) creek near Caron, for 1916

DAY	August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	0.28	0.22	0.05	0.02
2.....	Dry	Nil	0.25	0.19	0.24	0.18	0.06	0.02
3.....	"	"	0.21	0.15	0.05	0.02
4.....	"	"	0.25	0.19	0.10	0.05
5.....	"	"	0.27	0.21	0.15	0.09
6.....	"	"	0.28	0.22	Dry	Nil
7.....	"	"	0.40	0.35	0.29	0.23	"	"
8.....	"	"	0.26	0.20	"	"
9.....	"	"	0.26	0.20	"	"
10.....	"	"	0.29	0.23	"	"
11.....	0.20	0.14	.....	.....	0.25	0.19	"	"
12.....	Dry	Nil	.....	.....	0.10	0.05	"	"
13.....	"	"	Dry	Nil	"	"
14.....	0.06	0.02	.....	.....	"	"	"	"
15.....	0.05	0.02	0.42	0.37	"	"	"	"
16.....	0.10	0.05	.....	.....	"	"	"	"
17.....	Dry	Nil	0.16	0.10	.....	.....	"	"	"	"
18.....	0.10	0.05	.....	.....	0.25	0.19	"	"
19.....	0.05	0.02	.....	.....	0.25	0.19	"	"
20.....	Dry	Nil	.....	.....	0.25	0.19	"	"
21.....	"	"	0.24	0.18	"	"
22.....	"	"	0.38	0.33	0.23	0.17	"	"
23.....	"	"	0.36	0.31	0.19	0.13	"	"
24.....	0.08	0.04	.....	.....	0.14	0.08	"	"
25.....	0.12	0.07	0.36	0.31	0.10	0.05	"	"
26.....	0.34	0.28	0.08	0.04	"	"
27.....	0.36	0.31	0.05	0.02	"	"
28.....	0.40	0.35	0.06	0.02	"	"
29.....	0.25	0.19	0.46	0.42	0.07	0.03	"	"
30.....	0.38	0.33	0.06	0.02	"	"
31.....	"	"

x Observer absent, no gauge height recorded. Gauge heights represent the observed head on 6-inch weir.

SOURIS RIVER DRAINAGE BASIN

General Description

The source of the Souris river is in marshes near Yellow Grass, Saskatchewan. From here it flows in a southeasterly direction almost parallel to the Soo line of the Canadian Pacific railway to Estevan. It then flows east to Oxbow; then it turns south and crosses the international boundary in Range 34, W. of principal Meridian. After making a loop into North Dakota, it re-crosses the international boundary in Range 27, West of the 1st Meridian, and flows in a northeasterly direction to Souris, Manitoba, where it turns east, and finally joins the Assiniboine river, in Township 8, Range 16, West of the 1st Meridian.

The chief tributaries of Souris river are:—Long creek, which joins it near Estevan; Moose Mountain creek near Oxbow; North and South Antler creeks near Sourisford; Graham creek at Melita, and Pipestone creek near Souris.

This stream drains a large tract of typical western plains. The rainfall will probably average very little over fifteen inches, and is usually sufficiently divided over the year to prevent excessive run-off or floods. At times when there is an unusual amount of rainfall, and in the early spring, the water drains into the streams very rapidly and causes a flood of short duration.

There are towns, villages and farms all along the valley of this stream and its tributaries, which depend on it for a domestic and industrial water supply. The Canadian Pacific Railway is a large consumer. The town of Estevan has established a water works system, and at Weyburn several dams store water from Souris river. In North Dakota it has been proposed to divert water for irrigation purposes.

SOURIS RIVER AT WEYBURN

Location.—On SE. $\frac{1}{4}$ Sec. 20, Tp. 8, Rge. 14, W. 2nd Mer., about 200 feet south of Canadian Pacific railway depot, at Weyburn, and about fifteen feet from north abutment of dam.

Records available.—May 2, 1916, to December 31, 1916.

Gauge.—Vertical wooden staff; zero elevation maintained at 97.71 feet since establishment on May 17, 1916.

Bench-mark.—On top of north wing wall, southwest corner; assumed elevation 100.00 feet. Elevation of crest of dam north side referred to bench-mark 97.92 feet.

Channel.—One channel at all stages.

Discharge measurements.—Made during high and ordinary stages, from traffic bridge below dam; during low stages at a wading section about one mile southwest of town and below Beichel's dam.

Winter flow.—Stream freezes to bed.

Observer.—Jos. Scholes.

DISCHARGE MEASUREMENTS of Souris river at Weyburn, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 17.....	F. R. Shenstone.....	51.5	185.00	0.33	0.43	62.00
June 9.....	do.....	6.0	4.80	2.81	0.28	13.30
July 5.....	do.....	6.0	1.80	0.54	0.14	0.98 ⁿ
July 25.....	J. R. Estey.....				0.09	2.30 ^e
July 28.....	do.....	6.0	1.83	1.82	0.13	3.30 ⁿ
Aug. 15.....	do.....	6.0	0.84	1.25	0.05	1.05 ⁿ
Sept. 6.....	F. R. Shenstone.....				Dry	Nil
Oct. 10.....	do.....				0.03	"
Nov. 10.....	do.....				Dry	"

^e Discharge estimated from field inspection.

ⁿ Discharge measured at Beichel's dam, $\frac{1}{4}$ miles below gauge and regular section; liable to error.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Souris river at Weyburn, for 1916

DAY	May		June		July		August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	0.63	196	0.36	29.0	0.19	6.40	0.10	2.40	0.02	0.44	0.03	0.66
2....	0.46	83	0.35	25.0	0.16	4.70	0.13	3.50	0.02	0.44	0.03	0.66
3....	.....	76 ^e	0.36	29.0	0.15	4.20	0.12	3.10	0.02	0.44	0.03	0.66
4....	.....	68 ^e	0.38	36.0	0.15	4.20	0.13	3.50	0.02	0.44	0.03	0.66
5....	.....	60 ^e	0.37	33.0	0.15	4.20	0.13	3.50	0.02	0.44	0.03	0.66
6....	.....	52 ^e	0.36	29.0	0.15	4.20	0.12	3.10	0.02	0.44	0.03	0.66
7....	.....	44 ^e	0.34	23.0	0.10	2.40	0.11	2.80	0.02	0.44	0.03	0.66
8....	0.38	36	0.32	19.4	0.08	1.90	0.10	2.40	0.02	0.44	0.03	0.66
9....	0.54	136	0.31	17.6	0.05	1.10	0.09	2.10	0.02	0.44	0.03	0.66
10....	0.46	83	0.30	15.7	0.04	0.90	0.08	1.90	0.02	0.44	0.03	0.66
11....	0.46	83	0.28	13.6	0.02	0.44	0.07	1.62	0.08	1.90	0.01	0.22
12....	0.54	136	0.26	11.4	0.00	Nil	0.07	1.62	0.06	1.36	0.02	0.44
13....	0.46	83	0.24	9.7	0.00	"	0.07	1.62	0.05	1.10	0.01	0.22
14....	0.46	83	0.24	9.7	0.00	"	0.07	1.62	0.05	1.10	0.01	0.22
15....	0.46	83	0.24	9.7	0.00	"	0.07	1.62	0.06	1.36	0.02	0.44
16....	.....	74 ^e	0.24	9.7	0.00	"	0.06	1.36	0.07	1.62	0.02	0.44
17....	.....	66 ^e	0.23	9.0	0.00	"	0.04	0.90	0.07	1.62	0.01	0.22
18....	0.42	57	0.22	8.3	0.06	1.36	0.03	0.66	0.07	1.62	0.01	0.22
19....	0.41	50	0.21	7.6	0.06	1.36	0.03	0.66	0.07	1.62	0.00	Nil
20....	0.42	57	0.18	5.8	0.07	1.62	0.02	0.44	0.06	1.36	0.00	"
21....	0.42	57	0.20	6.9	0.07	1.62	0.02	0.44	0.05	1.10	0.00	"
22....	0.42	57	0.23	9.0	0.08	1.90	0.02	0.44	0.02	0.44	0.00	"
23....	0.42	57	0.23	9.0	0.08	1.90	0.02	0.44	0.02	0.44	0.00	"
24....	0.42	57	0.22	8.3	0.08	1.90	0.02	0.44	0.02	0.44	0.00	"
25....	0.42	57	0.21	7.6	0.09	2.20	0.02	0.44	0.02	0.44	0.00	"
26....	0.42	57	0.19	6.4	0.11	2.80	0.02	0.44	0.02	0.44	0.02	0.44
27....	0.42	57	0.18	5.8	0.11	2.80	0.02	0.44	0.02	0.44	0.01	0.22
28....	0.41	50	0.16	4.7	0.14	3.80	0.02	0.44	0.02	0.44	0.01	0.22
29....	0.39	40	0.16	4.7	0.12	3.10	0.02	0.44	0.02	0.44	0.01	0.22
30....	0.39	40	0.21	7.6	0.10	2.40	0.02	0.44	0.02	0.44	0.01	0.22
31....	0.38	36	.....	.....	0.09	2.10	0.02	0.44	.....	.....	0.01	0.22

No water flowing after Oct. 31, though water standing in pools.

^e Estimated discharge.

MONTHLY DISCHARGE of Souris river at Weyburn, for 1916

MONTH	DISCHARGE IN SECOND-FEET			RUN-OFF
	Maximum	Minimum	Mean	
				Total in Acre-feet
May.....	196.00	36.00	70.00	4,304
June.....	36.00	4.70	14.00	833
July.....	6.40	Nil	2.10	129
August.....	3.50	0.44	1.46	90
September.....	1.90	0.44	0.80	48
October.....	0.66	Nil	0.34	21
The period.....				5,425

LONG CREEK NEAR ESTEVAN

Location.—On SE. $\frac{1}{4}$ Sec. 10, Tp. 2, Rge. 8, W. 2nd Mer., two and one-half miles south of the town of Estevan.

Records available.—June 22, 1911, to December 31, 1916.

Gauge.—Vertical staff at old section at bridge; maintained at elevation 83.87 feet during 1911-12; at 83.90 feet in 1913, and at 83.87 feet in 1914-15. Vertical staff above weir used in winter time; zero of staff at elevation of crest. Vertical staff below a beaver dam used June 21, 1915, to December 31, 1916; zero elevation 83.20 feet.

Bench-marks.—Permanent iron bench-mark near bridge at old section; assumed elevation 100.00 feet. Top of three-inch stump on left bank, 42 feet up stream from last gauge mentioned; elevation 93.15 feet.

Channel.—Permanent.

Discharge measurements.—By wading at new section or by weir.

Winter flow.—By a 24-inch rectangular weir.

Observer.—Geo. Pawson.

DISCHARGE MEASUREMENTS of Long creek near Estevan, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. pr sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 12.....	F. R. Shenstone.....				0.17	0.46 _w
Feb. 15.....	do.....				0.16	0.42 _w
Mar. 14.....	do.....				0.17	0.46 _w
April 5.....	do.....				0.47	2.04 _w
May 18.....	do.....	20.0	27.00	1.20	2.67	33.00
June 9.....	do.....	19.5	21.00	0.93	2.27	19.90
July 7.....	do.....	19.0	19.00	0.92	2.14	17.50
July 25.....	J. R. Estey.....	17.0	10.30	0.47	1.50	4.80
Aug. 15.....	do.....	15.0	8.40	0.49	1.43	4.10
Sept. 8.....	F. R. Shenstone.....	9.6	1.56	0.55	1.24	0.86
Oct. 7.....	do.....	13.0	4.10	0.41	1.54	1.69
Nov. 11.....	do.....	14.0	5.00	0.46	1.58	2.30
Nov. 25.....	do.....	13.0	4.60	0.41	1.63	1.81
Dec. 22.....	do.....	11.5	3.95	0.37	1.31	1.48

_w Weir measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Long creek near Estevan, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	0.25	0.39	0.17	0.39	0.22	0.39	0.25	0.70 _s	9.10	280	2.30	21.0
2....	0.23	0.39	0.18	0.39	0.22	0.39	0.25	0.90	7.96	236	2.25	19.7
3....	0.21	0.39	0.18	0.39	0.22	0.39	0.30	1.40	.....	176 _e	2.20	18.4
4....	0.20	0.39	0.18	0.39	0.18	0.39	0.36	1.60	4.85	116	2.10	15.8
5....	0.22	0.39	0.15	0.39	0.15	0.39	0.34	2.05	4.30	95	2.00	13.6
6....	0.22	0.39	0.12	0.39	0.16	0.39	0.19	1.00	3.85	77	2.01	13.8
7....	0.21	0.39	0.10	0.39	0.15	0.39	0.45	1.40	3.50	64	2.18	17.8
8....	0.18	0.39	0.08	0.39	0.14	0.39	0.46	1.20	3.40	60	2.29	21.0
9....	0.18	0.39	0.08	0.39	0.13	0.39	1.50	5.70	3.30	56	2.26	20.0
10....	.....	0.39 _e	0.08	0.39	0.10	0.39	1.38	4.00	3.25	55	2.20	18.4
11....	0.17	0.39	0.08	0.39	0.12	0.39	1.00	2.00 _s	3.22	54	2.14	16.8
12....	0.23	0.39	0.10	0.39	0.15	0.39	9.96	313.00	3.14	50	2.08	15.4
13....	0.12	0.39	0.12	0.39	0.16	0.39	12.30	403.00	3.05	47	2.02	13.8
14....	0.22	0.39	0.13	0.39	0.16	0.39	15.05	509.00	3.00	45	2.25	19.7
15....	0.12	0.39	0.13	0.39	0.17	0.39	14.36	482.00	2.97	44	2.20	18.4
16....	0.13	0.39	0.19	0.39	0.18	0.39	13.70	457.00	2.94	43	2.11	16.1
17....	0.12	0.39	0.19	0.39	0.17	0.39	13.45	447.00	2.90	41	2.05	14.7
18....	0.12	0.39	0.19	0.39	0.16	0.39	12.69	418.00	2.75	36	2.00	13.6
19....	0.12	0.39	0.21	0.39	0.17	0.39	15.05	509.00	2.63	32	1.94	12.2
20....	0.12	0.39	0.22	0.39	0.17	0.39	.....	491.00 _e	2.60	30	1.86	10.6
21....	0.13	0.39	0.21	0.39	0.18	0.39	.....	473.00 _e	2.55	29	1.84	10.2
22....	0.13	0.39	0.21	0.39	0.18	0.39	.....	455.00 _e	2.58	30	1.95	12.4
23....	0.14	0.39	0.22	0.39	0.19	0.39	.....	437.00 _e	2.55	29	2.05	14.7
24....	0.10	0.39	0.22	0.39	0.17	0.39	.....	419.00 _e	2.50	27	2.04	14.5
25....	0.10	0.39	0.22	0.39	.....	0.39 _e	.....	401.00 _e	2.50	27	2.01	13.8
26....	0.08	0.39	0.24	0.39	0.19	0.39	.....	383.00 _e	2.45	26	1.99	13.3
27....	0.08	0.39	0.23	0.39	0.17	0.39	.....	365.00 _e	2.42	25	2.04	14.5
28....	.....	0.39 _e	0.22	0.39	0.24	0.39	.....	347.00 _e	2.36	23	2.05	14.7
29....	0.13	0.39	0.25	0.39	0.24	0.39	.....	330.00 _e	2.30	21	1.98	13.1
30....	0.13	0.39	.....	.....	0.22	0.39	9.96	313.00	2.27	20	2.55	29.0
31....	0.14	0.39	.....	.....	0.25	0.39	.....	.....	2.35	23	.....	.....

_e Discharge estimated.

_{s-s} Shifting conditions.

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Long creek near Estevan, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....	2.45	26.0	1.61	6.3	1.24	1.12	1.44	1.64	1.65	2.30	1.64	2.30
2.....	2.45	26.0	1.62	6.4	1.20	1.06	1.45	1.67	1.64	2.30	1.63	2.20
3.....	2.30	21.0	1.55	5.6	1.20	1.06	1.47	1.73	1.63	2.20	1.61	2.20
4.....	2.23	19.2	1.55	5.6	1.20	1.06	1.55	1.97	1.57	2.00	1.62	2.20
5.....	2.22	18.9	1.52	5.2	1.20	1.06	1.53	1.91	1.57	2.00	1.63	2.20
6.....	2.15	17.0	1.55	5.6	1.22	1.09	1.53	1.91	1.57	2.00	1.63	2.20
7.....	2.15	17.0	1.65	6.8	1.23	1.11	1.53	1.91	1.55	1.97	1.63	2.20
8.....	2.10	15.8	1.63	6.5	1.23	1.11	1.53	1.91	1.60	2.10	1.61	2.20
9.....	1.95	12.4	1.60	6.2	1.23	1.11	1.56	2.00	1.59	2.10	1.63	2.20
10.....	1.88	10.9	1.56	5.7	1.23	1.11	1.58	2.10	1.58	2.10	1.60	2.10
11.....	1.83	10.0	1.54	5.5	1.23	1.11	1.57	2.00	1.57	2.00	1.60	2.10
12.....	1.79	9.3	1.50	5.0	1.26	1.16	1.56	2.00	1.59	2.10	1.62	2.20
13.....	1.76	8.8	1.46	4.7	1.26	1.16	1.61	2.20	1.60	2.10	1.59	2.10
14.....	1.70	7.7	1.46	4.7	1.28	1.19	1.64	2.30	1.62	2.20	1.51	1.85
15.....	1.64	6.7	1.42	4.3	1.28	1.19	1.72	2.60	1.63	2.20	1.41	1.55
16.....	1.58	6.0	1.40	4.2	1.29	1.20	1.70	2.50	1.63	2.20	1.45	1.67
17.....	1.58	6.0	1.39	4.1	1.30	1.22	1.66	2.30	1.63	2.20	1.52	1.88
18.....	1.53	5.4	1.36	3.8	1.32	1.28	1.64	2.30	1.65	2.30	1.54	1.94
19.....	1.49	5.0	1.34	3.7	1.33	1.31	1.62	2.20	1.63	2.20	1.54	1.94
20.....	1.48	4.9	1.29	3.3	1.35	1.37	1.59	2.10	1.63	2.20	1.51	1.85
21.....	1.48	4.9	1.29	3.3	1.34	1.34	1.61	2.20	1.64	2.30	1.31	1.25
22.....	1.48	4.9	1.26	3.1	1.35	1.37	1.61	2.20	1.62	2.20	1.32	1.28
23.....	1.48	4.9	1.24	3.0	1.36	1.40	1.60	2.10	1.63	2.20	1.24	1.12
24.....	1.48	4.9	1.24	3.0	1.38	1.46	1.60	2.10	1.64	2.30	1.30	1.22
25.....	1.49	5.0	1.23	2.9	1.42	1.58	1.61	2.20	1.63	2.20	1.14	0.98
26.....	1.46	4.7	1.23	2.9	1.44	1.64	1.62	2.20	1.65	2.30	1.15	0.99
27.....	1.44	4.5	1.21	2.8	1.45	1.67	1.62	2.20	1.64	2.30	1.13	0.96
28.....	1.44	4.5	1.20	2.8	1.46	1.70	1.64	2.30	1.63	2.20	1.10	0.91
29.....	1.43	4.4	1.20	2.8	1.46	1.70	1.63	2.20	1.62	2.20	1.12	0.94
30.....	1.43	4.4	1.20	2.8	1.45	1.67	1.65	2.30	1.64	2.30	1.11	0.92
31.....	1.61	6.3	1.24	3.0	.....	.....	1.81	3.00	.....	.....	1.10	0.91

MONTHLY DISCHARGE of Long creek near Estevan, for 1916

(Drainage area 1,380 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	0.39	0.39	0.39	0.0004	0.0005	24
February.....	0.39	0.39	0.39	0.0004	0.0004	22
March.....	0.39	0.39	0.39	0.0004	0.0005	24
April.....	509.00	0.70	269.00	0.1950	0.2200	16,007
May.....	280.00	10.23	16.00	0.0120	0.0130	952
June.....	26.00	4.40	9.90	0.0110	0.0200	609
July.....	6.80	2.80	4.40	0.0030	0.0030	270
August.....	1.70	1.06	1.30	0.0010	0.0010	77
September.....	3.00	1.64	2.10	0.0020	0.0020	129
October.....	2.30	1.97	2.20	0.0020	0.0020	131
November.....	2.30	0.91	1.71	0.0010	0.0010	105
December.....	.....	.....	.....	.....	.....	.....
The year.....	.....	.....	.....	.....	0.2934	22,162

MEAN MONTHLY DISCHARGE in Second-feet of Long creek near Estevan

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		25.00 ^b	4.30	3.00	2.20	0.51	2.10	2.40	147
November.....			4.40 ^g		1.04	0.93	2.20	1.39	83
December.....					0.91	0.74	1.71	1.12	69
January.....					1.11	0.39		0.75	46
February.....					1.01	0.39		0.70	39
March.....			56.00 ^h		1.63	0.39		1.01	62
April.....		114.00 ^c	78.00	61.00 ^k	3.11	269.00		117.00	6,937
May.....		220.00 ^d	10.50	32.00	1.28	62.00		26.00	1,626
June.....	9.30 ^a	50.00 ^e	6.70	66.00	0.70	16.00		22.00	1,329
July.....	1.63	13.00 ^f	10.50	11.10	0.98	9.90		6.80	419
August.....	0.72	4.00	1.47	1.52	0.38	4.40		2.10	128
September.....	0.56	28.50	2.70	4.70	0.28	1.30		2.10	122
Total in acre-feet.....	343	13,107	7,273	8,951	883	21,929			11,007

^a 22-30.^b 1-30.^c 15-30.^d 21 days only, high water omitted.^e 1-25.^f 18-20.^g 1-15.^h 29-31.^k 16-30.

SOURIS RIVER NEAR ESTEVAN

Location.—On NE. $\frac{1}{4}$ Sec. 11, Tp. 2, Rge. 8, W. 2nd Mer., near the pumping plant of the Canadian Pacific Railway Company.

Records available.—June 23, 1911, to December 31, 1916.

Gauge.—Staff. Zero elevation of gauge was maintained at 82.45 feet during 1911-12; zero elevation of gauge was maintained at 82.55 feet during 1913-16.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Subject to debris on control.

Discharge measurements.—From bridge about one mile up stream, by wading at gauge, or by weir.

Winter flow.—Affected by ice. Permanent weir used winter of 1914-16.

Observer.—W. Bevan.

DISCHARGE MEASUREMENTS of Souris river near Estevan, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Jan. 12.....	F. R. Shenstone.....	2.5	0.95	0.52	0.68	0.49
Feb. 15.....	do.....	3.6	0.87	0.53	1.24	0.47
Mar. 14.....	do.....	4.9	1.28	0.53	1.44	0.68
April 5.....	do.....	4.9	2.24	1.76	2.22	4.00
May 18.....	do.....	69.0	96.20	1.32	3.68	127.00
June 9.....	do.....	26.5	24.10	2.18	2.50	53.00
July 7.....	do.....	22.0	19.80	1.98	2.13	39.00
July 25.....	J. R. Estey.....	17.0	12.40	1.52	1.59	18.80
Aug. 15.....	do.....	11.0	7.05	1.47	1.32	10.40
Sept. 8.....	F. R. Shenstone.....	10.0	3.30	1.00	1.10	3.30
Oct. 7.....	do.....	4.7	1.95	1.87	1.22	3.60
Nov. 11.....	do.....	5.2	2.47	1.50	1.15	3.70
Nov. 25.....	do.....	5.0	1.95	1.07	1.05	2.10
Dec. 22.....	do.....	4.7	2.03	0.50	0.94	1.03

SESSIONAL PAPER No. 25b

DAILY GAUGE HEIGHT AND DISCHARGE of Souris river near Estevan, for 1916

DAY	January		February		March		April		May		June	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1....	0.78	0.58	0.90	0.80	1.60	2.30	2.40	4.8	14.88	981	2.60	59
2....	0.78	0.58	0.90	0.80	1.65	2.40	2.40	4.8	13.44	871	2.55	57
3....	0.77	0.57	0.96	0.92	1.68	2.50	2.40	4.8	12.40	792	2.50	54
4....	0.76	0.56	0.98	0.96	1.70	2.60	2.45	5.0	10.39	638	2.50	54
5....	0.76	0.56	1.00	1.00	1.72	2.70	2.20	4.1	6.84	367	2.50	54
6....	0.76	0.56	1.20	1.40	1.76	2.80	2.30	4.4	5.60	272	2.53	56
7....	0.75	0.55	1.30	1.60	1.80	2.90	2.44	5.0	5.10	234	2.55	57
8....	0.74	0.54	1.25	1.50	1.80	2.90	2.44	5.0	6.05	307	2.60	59
9....	0.65	0.45	1.20	1.40	1.72	2.70	4.50	188.0	6.05	307	2.61	60
10....	0.68	0.48	1.20	1.40	1.55	2.20	6.00	303.0	6.05	307	2.62	60
11....	0.68	0.48	1.20	1.40	1.36	1.72	8.20	471.0	5.80	288	2.40	49
12....	0.70	0.50	1.20	1.40	1.40	1.80	9.50	570.0	4.55	192	2.30	45
13....	0.72	0.52	1.21	1.42	1.45	1.90	11.00	685.0	4.05	154	2.20	41
14....	0.72	0.52	1.22	1.44	1.42	1.84	12.90	830.0	3.75	131	2.20	41
15....	0.72	0.52	1.24	1.48	1.40	1.80	14.20	929.0	3.95	147	2.20	41
16....	0.74	0.54	1.26	1.52	1.38	1.76	.....	1,148.0e	4.00	150	2.15	38
17....	0.74	0.54	1.28	1.56	1.38	1.76	.....	1,317.0e	4.00	150	2.15	38
18....	0.74	0.54	1.30	1.60	1.40	1.80	20.18	1,386.0	3.68	126	2.10	36
19....	0.76	0.56	1.35	1.70	1.40	1.80	20.13	1,382.0	3.50	114	2.05	34
20....	0.76	0.56	1.36	1.72	1.48	1.96	20.10	1,380.0	3.45	110	2.00	32
21....	0.78	0.58	1.38	1.76	1.56	2.20	20.03	1,375.0	3.40	107	2.00	32
22....	0.80	0.60	1.40	1.80	1.80	2.90	19.98	1,371.0	3.30	101	2.00	32
23....	0.80	0.60	1.43	1.86	1.86	3.10	19.38	1,325.0	3.30	101	2.25	43
24....	0.82	0.64	1.46	1.92	1.90	3.20	18.98	1,294.0	3.20	94	2.20	41
25....	0.82	0.64	1.50	2.00	2.10	3.80	18.48	1,256.0	3.00	82	2.20	41
26....	0.84	0.68	1.50	2.00	2.12	3.90	18.08	1,226.0	2.95	78	2.05	34
27....	0.84	0.68	1.50	2.00	2.20	4.10	17.88	1,210.0	2.95	78	2.00	32
28....	0.84	0.68	1.56	2.20	2.32	4.50	17.53	1,184.0	3.05	85	2.00	32
29....	0.84	0.68	1.58	2.20	2.35	4.60	16.58	1,111.0	2.90	76	2.00	32
30....	0.86	0.72	.....	.....	2.36	4.70	16.98	1,142.0	2.80	70	2.65	62
31....	0.87	0.74	.....	.....	2.38	4.70	.....	.....	2.75	67	.....	.....

e Discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Souris river near Estevan, for 1916—*Concluded*

DAY	July		August		September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1....	2.45	52.0	1.54	16.9	1.06	6.4	1.15	2.6	1.30	3.20	0.95	1.80
2....	2.35	47.0	1.54	16.9	1.05	6.2	1.18	2.7	1.22	2.90	0.94	1.76
3....	2.25	43.0	1.47	15.2	1.05	6.2	1.20	2.8	1.25	3.00	0.94	1.76
4....	2.20	41.0	1.45	14.7	1.06	6.4	1.20	2.8	1.20	2.80	0.95	1.80
5....	2.18	40.0	1.45	14.7	1.07	6.6	1.20	2.8	1.18	2.70	0.95	1.80
6....	2.17	39.0	1.44	14.5	1.07	6.6	1.21	2.8	1.17	2.70	0.94	1.76
7....	2.13	38.0	1.43	14.2	1.07	6.6	1.20	2.8	1.15	2.60	0.94	1.76
8....	2.05	34.0	1.45	14.7	1.10	2.4	1.20	2.8	1.15	2.60	0.94	1.76
9....	2.03	34.0	1.45	14.7	1.10	2.4	1.21	2.8	1.16	2.60	0.94	1.76
10....	2.00	32.0	1.44	14.5	1.10	2.4	1.21	2.8	1.14	2.60	0.94	1.76
11....	2.00	32.0	1.42	14.0	1.11	2.4	1.22	2.9	1.15	2.60	0.94	1.76
12....	1.90	29.0	1.37	12.8	1.11	2.4	1.22	2.9	1.10	2.40	0.90	1.60
13....	1.85	27.0	1.35	12.3	1.12	2.5	1.22	2.9	1.08	2.30	0.88	1.52
14....	1.80	25.0	1.35	12.3	1.12	2.5	1.24	3.0	1.06	2.20	0.88	1.52
15....	1.78	24.0	1.30	11.1	1.14	2.6	1.25	3.0	1.01	2.00	0.86	1.44
16....	1.73	23.0	1.30	11.1	1.14	2.6	1.25	3.0	1.00	2.00	0.88	1.52
17....	1.72	23.0	1.30	11.1	1.12	2.5	1.25	3.0	1.00	2.00	0.85	1.40
18....	1.70	22.0	1.25	10.1	1.10	2.4	1.26	3.0	1.00	2.00	0.84	1.36
19....	1.65	20.0	1.20	9.1	1.10	2.4	1.28	3.1	0.98	1.92	0.83	1.32
20....	1.65	20.0	1.20	9.1	1.10	2.4	1.30	3.2	0.98	1.92	0.83	1.32
21....	1.64	20.0	1.15	8.1	1.12	2.5	1.30	3.2	0.98	1.92	0.94	1.76
22....	1.62	19.3	1.10	7.1	1.10	2.4	1.28	3.1	0.98	1.92	0.96	1.84
23....	1.61	19.0	1.05	6.2	1.10	2.4	1.28	3.1	0.98	1.92	1.00	2.00
24....	1.60	18.7	1.05	6.2	1.10	2.4	1.26	3.0	0.98	1.92	0.90	1.60
25....	1.59	18.4	1.06	6.4	1.12	2.5	1.24	3.0	0.95	1.80	0.86	1.44
26....	1.58	18.1	1.06	6.4	1.12	2.5	1.24	3.0	0.94	1.76	0.86	1.44
27....	1.55	17.1	1.06	6.4	1.13	2.5	1.23	2.9	0.94	1.76	0.70	1.00
28....	1.65	20.0	1.06	6.4	1.15	2.6	1.23	2.9	0.94	1.76	0.64	0.88
29....	1.55	17.1	1.06	6.4	1.15	2.6	1.22	2.9	0.95	1.80	0.60	0.80
30....	1.54	16.9	1.06	6.4	1.15	2.6	1.22	2.9	0.95	1.80	0.55	0.70
31....	1.53	16.6	1.06	6.4	.....	.....	1.25	3.0	.....	.....	0.54	0.68

MONTHLY DISCHARGE of Souris river near Estevan, for 1916

(Drainage area 4,550 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
January.....	0.74	0.45	0.58	0.0001	0.0001	36
February.....	2.20	0.80	1.55	0.0003	0.0003	89
March.....	4.70	1.72	2.80	0.0006	0.0007	172
April.....	1,386.00	4.10	771.00	0.1690	0.1900	45,878
May.....	981.00	67.00	244.00	0.0540	0.0600	15,003
June.....	60.00	32.00	45.00	0.0100	0.0100	2,678
July.....	52.00	16.60	27.00	0.0060	0.0070	1,660
August.....	16.90	6.20	10.80	0.0020	0.0020	664
September.....	6.60	2.40	3.40	0.0007	0.0008	202
October.....	3.20	2.60	2.90	0.0006	0.0007	178
November.....	3.20	1.76	2.20	0.0005	0.0006	131
December.....	1.80	0.68	1.52	0.0003	0.0003	93
The year.....	.....	.....	.....	.....	0.2725	66,784

SESSIONAL PAPER No. 25B

MEAN MONTHLY DISCHARGE in Second-feet of Souris river near Estevan

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		34.0	6.70	1.05	1.35	0.05	2.90	7.60	470
November.....		19.1 ^b	4.40	2.20	0.76	0.43	2.20	2.00	119
December.....			2.30	0.96	1.00	0.72	1.52	1.30	79
January.....			0.18	0.30	1.01	0.58		0.52	32
February.....			2.40	0.50	1.85	1.55		1.58	88
March.....			44.00	86.00	1.86	2.80		34.00	2,070
April.....			410.00	229.00	3.00	771.00		353.00	21,016
May.....			17.30	65.00	1.96	244.00		82.00	5,046
June.....	12.20 ^a	20.0 ^c	12.40	155.00	0.99	45.00		53.00	3,174
July.....	4.40	13.2	21.00	14.40	1.20	27.00		13.50	536
August.....	1.49	5.2	4.20	2.20	0.28	10.80		4.00	248
September.....	1.91	3.0	0.66	0.83	0.04	3.40		1.64	98
Total in acre-ft.....	670	4,194	31,457	33,506	919	66,455			33,276

^a 23-30.^b 1-15.^c 25-30.

MOOSE MOUNTAIN CREEK NEAR OXBOW

Location.—On NE. $\frac{1}{4}$ Sec. 15, Tp. 3, Rge. 2, W. 2nd Mer., one mile south and one-half mile west of the Canadian Pacific railway station at Oxbow.

Records available.—September 4, 1913, to October 11, 1916.

Gauge.—Vertical staff; zero elevation 91.94 feet from establishment until August 23, 1915, sometimes affected by backwater from Souris river. Vertical staff; zero elevation 92.31 feet, August 24, 1915, to October 31, 1916.

Bench-marks.—On stump of tree, fifty feet up stream from first gauge, painted white; assumed elevation 100.00 feet. Spike in tree on right bank at second gauge; elevation 98.84 feet.

Channel.—Permanent.

Discharge measurements.—By wading near first gauge or from bridge one-quarter mile up stream.

Winter flow.—No winter observations have been taken.

Observer.—Miss Flora Christmas.

DISCHARGE MEASUREMENTS of Moose Mountain creek near Oxbow, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 19.....	F. R. Shenstone.....	23.5	40.60	1.64	2.74	67.00
June 10.....	do.....	23.3	33.80	1.61	2.46	55.00
July 6.....	do.....	23.0	32.80	1.52	2.45	50.00
July 26.....	J. R. Estey.....	21.5	12.10	0.74	1.45	9.00
August 16.....	do.....	15.0	10.50	0.48	1.31	5.10
September 7.....	F. R. Shenstone.....				0.87	0.10 ^e
October 9.....	do.....	4.5	1.32	0.59	1.05	0.77

^e Discharge estimated; too small to measure.

DAILY GAUGE HEIGHT AND DISCHARGE of Moose Mountain creek near Oxbow; for 1916

DAY	April		May		June		July	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			6.32	246	2.63	62	2.74	67.0
2.....			5.95	228	2.59	60	2.71	66.0
3.....			5.76	218	2.43	52	2.69	64.0
4.....			5.60	210	2.52	56	2.54	57.0
5.....			5.13	186	2.53	56	2.48	54.0
6.....			4.77	168	2.48	54	2.45	53.0
7.....			4.35	148	.....	54 ^e	2.38	49.0
8.....	3.34		3.80	120	2.45	53	2.32	46.0
9.....	3.53		3.53	106	.....	52 ^e	2.25	43.0
10.....	3.38		3.53	106	2.44	52	2.37	49.0
11.....	3.74		3.29	94	2.40	50	2.14	38.0
12.....	4.44		3.15	88	2.58	49	2.04	33.0
13.....	5.90		3.13	86	2.34	47	1.84	24.0
14.....	7.90		2.95	78	2.30	45	1.82	23.0
15.....	.....^o		2.90	75	2.35	48	1.70	18.1
16.....			2.81	70	2.30	45	1.68	17.3
17.....			2.78	69	2.25	43	1.60	14.3
18.....	8.40 ^g		2.78	69	2.18	40	1.70	18.1
19.....	8.41	350	2.74	67	2.10	36	1.86	25.0
20.....	8.45	352	2.69	64	2.05	33	1.63	15.4
21.....	10.55	458	2.64	62	2.05	33	1.63	15.4
22.....	10.65	460	2.74	67	2.49	54	1.55	12.5
23.....	10.85	472	2.69	64	2.55	58	.....	11.0 ^e
24.....	10.47	454	2.63	62	2.45	53	1.50	10.7
25.....	9.78	419	2.62	61	2.35	48	1.45	9.0
26.....	9.08	384	2.59	60	2.24	42	1.44	8.7
27.....	8.45	352	2.73	66	2.15	38	1.43	8.4
28.....	7.81	320	2.62	61	.....	45 ^e	1.50	10.7
29.....	7.23	292	2.61	60	2.44	52	.....	10.0 ^e
30.....	5.81	220	2.53	56	2.85	72	1.45	9.0
31.....			2.59	60	.....	.....	1.43	8.4

^{o-g} Ice going out.^e Discharge estimated.

Not sufficient data to estimate discharge during spring break-up.

SESSIONAL PAPER No. 258

DAILY GAUGE HEIGHT AND DISCHARGE of Moose Mountain creek near Oxbow, for 1916—*Concluded*

DAY	August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	1.34	6.00	0.91	0.12	0.90	0.10
2.....	1.30	5.00	0.91	0.12	0.96	0.24
3.....	1.28	4.60	0.92	0.14	1.05	0.80
4.....	1.30	5.00	0.91	0.12	1.07	1.04
5.....	1.29	4.80	0.90	0.10	1.07	1.04
6.....	1.37	6.80	.....	0.10e	1.08	1.16
7.....	1.32	5.50	0.87	0.10	1.09	1.28
8.....	1.51	11.10	0.87	0.10	1.06	0.92
9.....	.....	12.00e	0.86	0.10	1.01	0.48
10.....	1.60	14.30	.....	0.10e	1.21	3.20
11.....	1.59	13.90	0.87	0.10	1.22	3.40
12.....	1.58	13.60	0.87	0.10	1.24	3.80
13.....	1.59	13.90	0.87	0.10	1.25	4.00
14.....	1.38	7.00	0.86	0.10	1.28	4.60
15.....	1.30	5.00	0.86	0.10	1.29	4.80
16.....	1.28	4.60	0.86	0.10	1.30	5.00
17.....	1.21	3.20	0.86	0.10	1.33	5.70
18.....	1.19	2.80	0.86	0.10	1.35	6.20
19.....	1.14	1.96	0.86	0.10	1.39	7.30
20.....	1.10	1.40	0.87	0.10	1.37	6.80
21.....	1.09	1.28	0.84	0.10	1.35	6.20
22.....	1.09	1.28	0.83	0.10	1.37	6.80
23.....	1.08	1.16	0.87	0.10	1.40	7.60
24.....	1.08	1.16	0.87	0.10	1.40	7.60
25.....	1.07	1.04	0.87	0.10	1.41	7.90
26.....	1.06	0.92	0.88	0.10	1.45	9.00
27.....	1.05	0.80	0.89	0.10	1.47	9.70
28.....	1.05	0.80	0.89	0.10	1.48	10.00
29.....	0.92	0.14	0.91	0.12	1.53	11.80
30.....	0.92	0.14	0.91	0.12	1.51	11.10
31.....	0.92	0.14	.....	.....	1.54	12.10x

e Discharge estimated.

x Rise in October due to snow.

MONTHLY DISCHARGE of Moose Mountain creek near Oxbow, for 1916

(Drainage area 2,953 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April (19-30).....	472.00	220.00	378.00	0.128	0.06	8,995
May.....	246.00	56.00	102.00	0.035	0.04	6,272
June.....	72.00	33.00	49.00	0.017	0.02	2,916
July.....	67.00	8.40	29.00	0.010	0.01	1,783
August.....	14.30	0.14	4.90	0.002	0.00	301
September.....	0.14	0.10	0.10	0.000	0.00	6
October.....	12.10	0.10	5.20	0.002	0.00	320
The period.....	.....	.....	.....	.....	0.13	20,593

SOURIS RIVER NEAR GLEN EWEN

Location.—On NE. $\frac{1}{4}$ Sec. 36, Tp. 2, Rge. 1, W. 2nd Mer., two miles south and one mile east of Canadian Pacific railway station at Glen Ewen.

Records available.—June 26, 1911, to October 31, 1916.

Gauge.—Vertical staff; zero maintained at elevation of 79.32 feet during 1911, and at 78.98 feet during 1912-1916.

Bench-mark.—Permanent iron bench-mark; assumed elevation 100.00 feet.

Channel.—Affected by beaver dams and debris on control.

Discharge measurements.—By wading at ford one-quarter mile below gauge, or from bridge one mile above gauge.

Winter flow.—No observations have been taken.

Observer.—D. F. Preston.

DISCHARGE MEASUREMENTS of Souris river near Glen Ewen, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
May 19.....	F. R. Shenstone.....	56.0	292.0	0.96	5.04	282.0
June 10.....	do.....	55.0	222.0	0.75	3.68	160.0
July 6.....	do.....	56.0	121.0	1.34	3.79	162.0
July 26.....	J. R. Estey.....	45.0	62.0	0.82	2.44	51.0
Aug. 16.....	do.....	44.4	52.8	0.59	2.26	31.0
Sept. 7.....	F. R. Shenstone.....	35.0	17.0	0.45	1.95	7.7
Oct. 9.....	do.....	37.0	26.3	0.41	2.22c	10.8

c Gauge height affected by backwater from beaver dam.

DAILY GAUGE HEIGHT AND DISCHARGE of Souris river near Glen Ewen, for 1916

DAY	April		May		June		July	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....			17.05	1,387	4.14	199	3.66	155
2.....			16.40	1,327	4.08	194	3.67	156
3.....			15.55	1,249	3.97	183	4.02	188
4.....			14.70	1,171	3.82	180	3.95	182
5.....	3.10b		13.80	1,088	3.82	180	3.94	181
6.....			12.90	1,005	3.77	165	3.79	167
7.....	4.15		11.25	853	3.75	163	3.53	144
8.....	3.30		9.60	701	3.73	161	3.44	135
9.....	6.55		8.24	576	3.71	160	3.23	116
10.....	7.80		7.27	487	3.69	158	3.15	109
11.....			7.90		3.72	161	3.07	102
12.....	8.15		6.74	438	3.70	159	2.95	92
13.....	9.26b		6.45	412	3.57	147	2.85	83
14.....	12.18g		6.28	396	3.50	141	2.78	77
15.....	14.30		5.89	360	3.40	132	2.70	70
16.....	16.60g		5.64	337	3.38	130	2.67	68
17.....	18.00	1,474	5.38	313	3.36	128	2.64	65
18.....	19.11	1,576	5.20	296	3.28	121	2.61	62
19.....	18.91	1,558	5.04	282	3.26	119	2.55	57
20.....	18.50	1,520	4.97	270	3.18	112	2.56	58
21.....	18.85	1,553	4.90	269	3.06	101	2.50	53
22.....	19.59	1,620	4.93	271	3.10	105	2.47	51
23.....	20.00	1,658	4.92	271	3.36	128	2.44	48
24.....	20.17	1,674	4.71	251	3.57	147	2.39	44
25.....	20.15	1,672	4.56	238	3.58	148	2.40	45
26.....	19.95	1,654	4.52	234	3.57	147	2.45	49
27.....	19.57	1,618	4.50	232	3.43	134	2.44	48
28.....	19.21	1,585	4.44	227	3.91	178	2.45	49
29.....	18.67	1,536	4.33	216	4.01	187	2.44	48
30.....	17.95	1,470	4.20	204	3.67	156	2.44	48
31.....			4.18	203			2.44	48

b-b Ice conditions.

g-g Ice going out.

Not sufficient data to estimate discharge during spring break-up, April 5-16.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Souris river near Glen Ewen, for 1916—*Concluded*

DAY	August		September		October	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	2.44	48.00	1.86	2.3	2.13	7.6
2.....	2.44	48.00	1.88	2.8	2.15	9.1
3.....	2.35	40.00	1.90	3.4	2.16	9.6
4.....	2.33	39.00	1.92	5.0	2.19	11.1
5.....	2.31	37.00	1.97	9.1	2.16	8.6
6.....	2.41	46.00	1.96	8.3	2.19	10.1
7.....	2.39	44.00	1.95s	7.5	2.22	12.6
8.....	2.37	42.00	1.94	6.1	2.23	12.1
9.....	2.35	40.00	1.93	4.7	2.20	9.6
10.....	2.50	53.00	1.94	4.9	2.19	8.1
11.....	2.42	40.00	1.94	4.3	2.19	7.6
12.....	2.37	42.00	1.97	6.1	2.23	10.5
13.....	2.36	41.00	1.96	4.7	2.25	11.6
14.....	2.34	40.00	1.98	5.8	2.23	9.0
15.....	2.30	36.00	2.01	7.6	2.23	8.5
16.....	2.25	32.00	2.02	7.8	2.23	8.0
17.....	2.22	30.00	2.00	5.6	2.24	8.5
18.....	2.22	30.00	2.02	6.6	2.24	8.0
19.....	2.19	27.00	2.10	12.6	2.24	7.5
20.....	2.16	25.00	2.11	13.2	2.23	6.0
21.....	2.12	21.00	2.04	6.5	2.25	7.5
22.....	2.08	18.20	2.06	7.5	2.25	7.0
23.....	2.05	15.70	2.08	8.6	2.27	8.5
24.....	2.04	14.90	2.05	5.5	2.28	9.0
25.....	2.03	14.10	2.07	6.5	2.29	9.0
26.....	1.97	9.10	2.13	10.6	2.29	9.0
27.....	1.95	7.50	2.14	11.0	2.31	11.0
28.....	1.92	5.00	2.14	10.4	2.32	12.0
29.....	1.86	2.30	2.12	7.8	2.34	14.0
30.....	1.85	2.00	2.10	6.0	2.34	14.0
31.....	1.84	1.80	.....	.....	2.34s	14.0

s-s Shifting conditions due to beaver dam.

MONTHLY DISCHARGE of Souris river near Glen Ewen, for 1916

(Drainage area 7,500 square miles)

MONTH	DISCHARGE IN SECOND-FEET				RUN-OFF	
	Maximum	Minimum	Mean	Per square Mile	Depth in inches on Drainage Area	Total in Acre-feet
April (17-30).....	1,674.0	1,470.00	1,583.0	0.211	0.110	43,947
May.....	1,387.0	203.00	518.0	0.069	0.080	31,851
June.....	199.0	101.00	151.0	0.020	0.020	8,985
July.....	188.0	44.00	90.0	0.012	0.010	5,534
August.....	53.0	1.80	29.0	0.004	0.005	1,783
September.....	13.2	2.30	7.0	0.001	0.001	417
October.....	14.0	6.00	9.6	0.001	0.001	590
The period.....	.....	.....	.....	.....	0.227	93,107

MEAN MONTHLY DISCHARGE in Second-feet of Souris river near Glen Ewen

MONTH	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	Mean in Sec.-ft.	Mean in Acre-ft.
October.....		72.0	12.3	18.4	15.30	1.06	9.6	21.00	1,322
November.....		53.0 ^b	9.4 ^d						
December.....									
January.....					Nil				
February.....									
March.....					0.17			0.17	10
April.....		456.0 ^c	345.0 ^e	373.0 ^g	14.60	1,583.00 ^f		14.60	869
May.....		514.0	94.0	183.0	12.80	518.00		264.00	16,260
June.....	30.0 ^a	109.0	41.0	170.0	17.60	151.00		98.00	5,818
July.....	16.7	24.0	46.0	48.0	25.00	90.00		42.00	2,561
August.....	14.7	15.8	17.0	9.4	3.70	29.00		14.90	914
September.....	18.6	10.0	9.4	10.8	1.05	7.00		9.50	564
Total in acre-ft.....	3,338	61,650	23,972	37,768	5,453	92,583			28,318

^a 26-30.^b 1-15.^c 15-30.^d 1-15.^e 16-30.^f 17-30.^g 16-30.

BIG QUILL LAKE DRAINAGE BASIN

SPRING CREEK NEAR WYNARD

Location.—On SE. $\frac{1}{4}$ Sec. 30, Tp. 32, Rge. 15, W. 2nd Mer., about three miles east of Wynard and 200 feet south of Canadian Pacific railway track.

Records available.—For part of the year 1916.

Gauge.—Vertical enamel staff, about five feet above weir.

Bench-mark.—None.

Weir.—Permanent, sharp-crested, rectangular weir, twenty-four inches wide.

Channel.—One channel during all stages; permanent.

Discharge measurements.—Made with permanent weir or from Canadian Pacific railway bridge during high stages.

Observer.—F. Cipka.

DISCHARGE MEASUREMENTS of Spring creek near Wynward, in 1916

Date	Engineer	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
		<i>Feet</i>	<i>Sq. ft.</i>	<i>Ft. per sec.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
Mar. 1.....	F. R. Shenstone.....					0.05
April 15.....	do.....	25	50	1.02	2.90	51.00
July 15.....	J. R. Estey.....					Nil
Aug. 1.....	do.....				0.15	0.38 ^w
Aug. 20.....	do.....				0.06	0.10 ^w
Oct. 4.....	F. R. Shenstone.....				0.07	0.12 ^w
Oct. 28.....	do.....				0.29	1.01 ^w

^x No gauge set.^w Weir measurement.

SESSIONAL PAPER No. 25B

DAILY GAUGE HEIGHT AND DISCHARGE of Spring creek near Wynyard, for 1916.

DAY	April		May		August	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1.....			0.25	0.81		
2.....			0.26	0.86		
3.....			0.20	0.60		
4.....	1.00	12.20	0.25	0.81		
5.....	1.50	22.00	0.26	0.86		
6.....	1.55	23.00	0.25	0.81		
7.....	1.60	24.00	0.24	0.76	0.12	0.28
8.....	1.62	25.00	0.21	0.65	0.12	0.28
9.....	1.70	26.00	0.20	0.60	0.14	0.35
10.....	1.90	31.00	0.25	0.81	0.11	0.24
11.....	1.90	31.00	0.25	0.81	0.11	0.24
12.....	1.90	31.00	0.24	0.76	0.00	0.00
13.....	2.00	33.00	0.24	0.76	0.03	0.03
14.....	2.10	35.00	0.24	0.76	0.03	0.03
15.....	2.90	51.00	0.20	0.60	0.03	0.03
16.....	2.60	45.00	0.20	0.60	0.03	0.03
17.....	2.20	37.00	0.20	0.60	0.03	0.03
18.....	1.90	31.00	0.18	0.50	0.03	0.03
19.....	1.60	24.00	0.18 ^x	0.50	0.03	0.03
20.....	1.20	16.30			0.06	0.10
21.....	1.00	12.20			0.06	0.10
22.....	1.00	12.20			0.06	0.10
23.....	0.80	8.20			0.06	0.10
24.....	0.55	3.10			0.05	0.08
25.....	0.48	2.20			0.05	0.08
26.....	0.45	1.93			0.05	0.08
27.....	0.41	1.68				0.09 ^e
28.....	0.39	1.56			0.06	0.10
29.....	0.31	1.11			0.07	0.12
30.....	0.30	1.07			0.07	0.12
31.....					0.07	0.12

^x Canadian Pacific railway pumping station closed; no records obtained from May 18 to Aug. 7.^e Discharge estimated.

DAILY GAUGE HEIGHT AND DISCHARGE of Spring creek near Wynyard, for 1916—*Concluded*

DAY	September		October		November		December	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge
	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>	<i>Feet</i>	<i>Sec.-ft.</i>
1.....	0.07	0.12	.....	0.10 _e	0.29	1.00	0.10	0.20
2.....	0.07	0.12	0.06	0.10	0.29	1.00	0.10	0.20
3.....	.....	0.12 _e	0.06	0.10	0.29	1.00	.....	0.19 _e
4.....	0.07	0.12	0.06	0.10	0.29	1.00	0.09	0.18
5.....	0.07	0.12	0.07	0.12	.....	0.77 _e	0.09	0.18
6.....	0.07	0.12	0.07	0.12	0.19	0.54	0.09	0.18
7.....	0.07	0.12	0.07	0.12	0.18	0.50	0.09	0.18
8.....	0.06	0.10	.....	0.20 _e	0.16	0.42	0.09	0.18
9.....	.....	0.10 _e	0.12	0.25	0.16	0.42	0.09	0.18
10.....	0.06	0.10	0.11	0.24	0.15	0.38	.....	0.18 _e
11.....	0.06	0.10	0.11	0.24	0.12	0.28	0.09	0.18
12.....	0.06	0.10	0.09	0.18	.....	0.24 _e	0.09	0.18
13.....	0.07	0.12	0.09	0.18	0.10	0.20	0.09	0.18
14.....	0.07	0.12	0.08	0.16	0.09	0.18	0.08	0.16
15.....	0.06	0.10	.....	0.16 _e	0.07	0.12	0.08	0.16
16.....	.....	0.09 _e	0.08	0.16	0.06	0.10	0.08	0.16
17.....	0.05	0.08	0.08	0.16	0.10	0.20	.....	0.14 _e
18.....	0.05	0.08	0.09	0.18	0.10	0.20	0.07	0.12
19.....	0.06	0.10	0.09	0.18	.....	0.20 _e	0.07	0.12
20.....	0.06	0.10	0.14	0.34	0.10	0.20	0.10	0.20
21.....	0.06	0.10	0.15	0.38	0.10	0.20	0.10	0.20
22.....	0.06	0.10	0.15	0.38	0.10	0.20	0.10	0.20
23.....	0.06	0.10	0.17	0.46	0.10	0.20	0.10	0.20
24.....	.....	0.10 _e	0.17	0.46	0.10	0.20	.....	0.19 _e
25.....	0.06	0.10	0.19	0.54	0.10	0.20	0.09	0.18
26.....	0.06	0.10	0.23	0.71	.....	0.20 _e	0.09	0.18
27.....	0.06	0.10	0.23	0.71	0.10	0.20	0.08	0.16
28.....	0.07	0.12	0.20	0.60	0.10	0.20	0.09	0.18
29.....	0.07	0.12	.....	0.60 _e	0.10	0.20	0.09	0.18
30.....	0.06	0.10	0.20	0.60	0.10	0.20	0.08	0.16
31.....	.....	.....	0.29	1.00	.....	.....	.....	0.16 _e

e Discharge estimated.

MONTHLY DISCHARGE of Spring creek near Wynyard, for 1916

MONTH	DISCHARGE IN SECOND-FEET			RUN-OFF
	Maximum	Minimum	Mean	Total in Acre-feet
April (4-30).....	51.00	1.07	20.00	1,071.0
May.....	0.86	0.50	0.71	27.0
August.....	0.35	0.03	0.11	5.5
September.....	0.12	0.08	0.11	6.5
October.....	1.00	0.10	0.32	19.7
November.....	1.00	0.10	0.37	22.0
December.....	0.20	0.12	0.18	11.2
The period.....				1,162.9

INDEX

A	Page		Page
Absorption losses, in canals:		Battle creek drainage basin:	
investigations, during 1916.....	17	general description.....	414
Acre-foot:		miscellaneous discharge measurements, in	
definition of.....	19	1916.....	433
Adams' North ditch near Cypress P.O.:		Battle creek at Nash's ranch:	
description.....	535	description.....	429
Adams' South ditch near Cypress P.O.:		discharge measurements, in 1916.....	430
description.....	535	daily gauge height and discharge, for 1916.....	431
discharge measurements, in 1916.....	535	monthly discharge, for 1916.....	432
daily gauge height and discharge, for 1916.....	535	historic summary.....	433
monthly discharge, for 1916.....	536	Battle creek at Tenmile Police Detachment:	
Alberta Railway and Irrigation Company's		description.....	420
Canal, at Kimball:		discharge measurements, in 1916.....	421
description.....	331	daily gauge height and discharge, for 1916.....	421
discharge measurements, in 1916.....	331	monthly discharge, for 1916.....	422
daily gauge height and discharge, for 1916.....	332	historic summary.....	423
monthly discharge, for 1916.....	333	Battle creek at Wilkes' ranch:	
Alberta Railway and Irrigation Company's		description.....	425
Canal, near Kimball:		discharge measurements, in 1916.....	425
description.....	334	daily gauge height and discharge, for 1916.....	426
discharge measurements, in 1916.....	334	monthly discharge, for 1916.....	427
daily gauge height and discharge, for 1916.....	334	Battle river at Battleford:	
monthly discharge, for 1916.....	335	description.....	129
historic summary.....	336	discharge measurements, in 1916.....	129
Alberta Railway and Irrigation Company's		daily gauge height and discharge, for 1916.....	130
Canal, at Spring Coulee:		monthly discharge, for 1916.....	131
description.....	345	Battle river at Ponoka:	
discharge measurements, in 1916.....	345	description.....	126
daily gauge height and discharge, for 1916.....	346	discharge measurements, in 1916.....	126
monthly discharge, for 1916.....	346	daily gauge height and discharge, for 1916.....	127
Allison creek near Sentinel:		monthly discharge, for 1916.....	128
description.....	250	Bear creek (NW. 16-81-6-6):	
discharge measurements, in 1916.....	251	discharge measurement, in 1916.....	43
Anderson ditch from East Branch of Lodge creek:		Bear creek at Unsworth's ranch:	
description.....	396	description.....	521
Antelope lake drainage basin:		discharge measurements, in 1916.....	521
general description.....	511	daily gauge height and discharge, for 1916.....	522
Athabaska river drainage basin:		monthly discharge, for 1916.....	523
general description.....	43	historic summary.....	524
miscellaneous discharge measurements,		Bear creek, East Branch (NE. 29-10-23-3):	
in 1916.....	78	discharge measurements, in 1916.....	529
Athabaska river at Athabaska:		Bear creek, West Branch (NW. 29-10-23-3):	
description.....	75	discharge measurements, in 1916.....	529
discharge measurements, in 1916.....	75	Beaure creek (SE. 15-26-5-5):	
daily gauge height and discharge, for 1916.....	76	discharge measurements, in 1916.....	24 5
monthly discharge, for 1916.....	77	Belanger creek at Oakes' ranch:	
Athabaska river near Hinton:		description.....	443
description.....	56	discharge measurements, in 1916.....	443
discharge measurements, in 1916.....	56	daily gauge height and discharge, for 1916.....	444
daily gauge height and discharge, for 1916.....	57	monthly discharge, for 1916.....	445
monthly discharge, for 1916.....	58	historic summary.....	446
Athabaska river at Jasper:		Bellevue creek (SE. 29-7-3-5):	
description.....	46	discharge measurements, in 1916.....	302
discharge measurements, in 1916.....	46	Belly river drainage basin:	
daily gauge height and discharge, for 1916.....	47	general description.....	315
monthly discharge, for 1916.....	48	Belly river near Lethbridge:	
Axton ditch from Swiftcurrent creek:		see Oldman river	
description.....	495	Belly river near Mountain View:	
		description.....	315
		discharge measurements, in 1916.....	316
		daily gauge height and discharge, for 1916.....	316
		monthly discharge, for 1916.....	317
		historic summary.....	318
		Belly river near Stand Off:	
		description.....	321
		discharge measurements, in 1916.....	322
		daily gauge height and discharge, for 1916.....	322
		monthly discharge, for 1916.....	323
		historic summary.....	324
		Bench-marks:	
		description of.....	17
		Beveridge West ditch from Pisapot creek:	
		description.....	526
		Bigbreed creek near Buzzard's ranch:	
		description.....	475
		discharge measurements, in 1916.....	475
		daily gauge height and discharge, for 1916.....	476
		monthly discharge, for 1916.....	476
		Bigbill creek (SW. 10-26-4-5):	
		discharge measurements, in 1916.....	245
		Bighorn river near mouth of stream:	
		description.....	85
		discharge measurements, for 1916.....	85

B

Banff District:	
summary of work, for 1916.....	8
Bare creek (SW. 25-3-1-4):	
discharge measurements, in 1916.....	413
Barnett (W. H.) ditch from Doyle creek:	
description.....	456
Barroby ditch from North Branch of Frenchman	
river:	
description.....	456
Bate creek at Bate's ranch:	
description.....	465
discharge measurements, in 1916.....	465
daily gauge height and discharge, for 1916.....	466
monthly discharge, for 1916.....	467
Bath creek near lake Louise:	
description.....	153
discharge measurements, in 1916.....	154
daily gauge height and discharge, for 1916.....	154
monthly discharge, for 1916.....	155

	Page
Bighorn river (Sec. 33-39-17-5):	
discharge measurement, in 1916.....	136
Big Quill Lake Drainage Basin.....	596
Big Rat creek (NW. 11-80-5-6):	
discharge measurement, in 1916.....	43
Bigstick lake drainage basin:	
general description.....	534
miscellaneous discharge measurements, in 1916.....	547
Blackstone river near Grass mountain (formerly South branch of Brazeau river):	
description.....	100
discharge measurements, in 1916.....	100
Blacktail creek (NW. 20-6-23-3):	
discharge measurements, in 1916.....	490
Blairmore creek (SE. 10-8-4-5):	
discharge measurements, in 1916.....	302
Blakiston brook (SE. 36-1-30-4):	
discharge measurements, in 1916.....	315
Blindman river near Blackfalds:	
description.....	140
discharge measurements, in 1916.....	140
daily gauge height and discharge, for 1916.....	141
monthly discharge, for 1916.....	142
Bone creek at Lewis' ranch:	
description.....	499
discharge measurements, in 1916.....	499
daily gauge height and discharge, for 1916.....	500
monthly discharge, for 1916.....	501
historic summary.....	502
Boundary creek at Fidler Bros.' ranch:	
description.....	325
discharge measurements, in 1916.....	325
daily gauge height and discharge, for 1916.....	325
monthly discharge, for 1916.....	326
historic summary.....	327
Bow river drainage basin:	
general description.....	153
miscellaneous discharge measurements, in 1916.....	245
Bow river at Banff:	
description.....	168
discharge measurements, in 1916.....	168
daily gauge height and discharge, for 1916.....	169
monthly discharge, for 1916.....	170
historic summary.....	171
Bow river near Bassano:	
description.....	242
discharge measurements, in 1916.....	242
daily gauge height and discharge, for 1916.....	243
monthly discharge, for 1916.....	244
Bow river at Calgary:	
description.....	193
discharge measurements, in 1916.....	193
daily gauge height and discharge, for 1916.....	194
monthly discharge, for 1916.....	195
historic summary.....	196
Bow river near Cochrane:	
description.....	192
discharge measurements, in 1916.....	192
Bow river near Kananaskis:	
description.....	180
discharge measurements, in 1916.....	180
daily gauge height and discharge, for 1916.....	181
monthly discharge, for 1916.....	182
historic summary.....	183
Bow river near Lake Louise:	
description.....	156
discharge measurements, in 1916.....	156
daily gauge height and discharge, for 1916.....	157
monthly discharge, for 1916.....	158
historic summary.....	159
Bowrey ditch from Rock creek, Montana, U.S.A.:	
description.....	487
Boxelder creek, Young's ranch:	
description.....	551
discharge measurements, in 1916.....	551
daily gauge height and discharge, for 1916.....	552
monthly discharge, for 1916.....	553
historic summary.....	554
Braniff ditch from Bear creek:	
description.....	525
Bridge creek at Gull lake:	
description.....	514
discharge measurements, in 1916.....	514
daily gauge height and discharge, for 1916.....	515
monthly discharge, for 1916.....	516
Bridge creek at Raymond's ranch:	
description.....	511
discharge measurements, in 1916.....	512
daily gauge height and discharge, for 1916.....	512
monthly discharge, for 1916.....	513
historic summary.....	514

	Page
Brown creek:	
description.....	101
discharge measurements, in 1916.....	101
Brown (Miss A. H.) ditch from Gros Ventre creek:	
description.....	555
Bullhead creek near Dunmore:	
description.....	565
discharge measurements, in 1916.....	565
Bullhead creek at Johnston's ranch:	
description.....	561
discharge measurements, in 1916.....	562
daily gauge height and discharge, for 1916.....	562
monthly discharge, for 1916.....	563
Burnt river (SE. 7-80-1-6):	
discharge measurement, in 1916.....	43
Buzzard's ditch (NW. 11-2-11-3):	
discharge measurements, in 1916.....	490
C	
Calf creek (SE. 5-8-22-3):	
discharge measurements, in 1916.....	490
Calgary District:	
summary of work in 1916.....	9
Cameron creek at Waterton park:	
description.....	303
discharge measurements, in 1916.....	303
daily gauge height and discharge, for 1916.....	304
monthly discharge, for 1916.....	305
Canadian Pacific Railway Company Canal, North branch, near Bassano:	
description.....	236
discharge measurements, in 1916.....	236
daily gauge height and discharge, for 1916.....	237
monthly discharge, for 1916.....	238
Canadian Pacific Railway Company Canal, East branch, near Bassano:	
description.....	239
discharge measurements, in 1916.....	239
daily gauge height and discharge, for 1916.....	240
monthly discharge, for 1916.....	241
Canadian Pacific Railway Company Canal, at Ogden:	
description.....	205
discharge measurements, in 1916.....	205
daily gauge height and discharge, for 1916.....	206
monthly discharge, for 1916.....	206
historic summary.....	207
Canadian Pacific Railway Company Canal (SE. 8-18-16-4):	
discharge measurement, in 1916.....	245
Canal creek (SW. 27-3-6-4):	
discharge measurements, in 1916.....	389
Canyon creek near Mountain Mill:	
description.....	276
discharge measurements, in 1916.....	276
daily gauge height and discharge, for 1916.....	276
monthly discharge, for 1916.....	277
historic summary.....	278
Carbondale creek at Evans' ranch:	
description.....	271
discharge measurements, in 1916.....	271
daily gauge height and discharge, for 1916.....	272
monthly discharge, for 1916.....	273
Cardston District:	
summary of work in 1916.....	10
Carmichael ditch near Stavely:	
description.....	290
Carol creek (Sec. 12-37-19-5):	
discharge measurement, in 1916.....	136
Cascade river at Bankhead:	
description.....	177
discharge measurements, in 1916.....	177
daily gauge height and discharge, for 1916.....	178
monthly discharge, for 1916.....	179
historic summary.....	180
Castle river near Cowley:	
description.....	281
discharge measurements, in 1916.....	281
daily gauge height and discharge, for 1916.....	282
monthly discharge, for 1916.....	283
historic summary.....	284
Castle river at McDonald's ranch:	
description.....	274
discharge measurements, in 1916.....	274
daily gauge height and discharge, for 1916.....	274
monthly discharge, for 1916.....	275
Changing conditions:	
of channel.....	27

DE

East Branch of Lodge creek: see Lodge creek.	
East Branch of Mackay creek: see Mackay creek.	
East Prairie river (SW. 11-74-16-5): discharge measurements, in 1916	78
Eastern Cypress Hills District: summary of work, in 1916	12
Edmonton District: summary of work, in 1916	15
Elbow river at Calgary: description	199
discharge measurements, in 1916	199
daily gauge height and discharge, for 1916	200
monthly discharge, for 1916	201
historic summary	202
Elbow river at Fullerton's ranch: description	196
discharge measurements, in 1916	196
daily gauge height and discharge, for 1916	197
monthly discharge, for 1916	198
Elton ditch from Todd creek: description	264
discharge measurements, in 1916	264
daily gauge height and discharge, for 1916	265
monthly discharge, for 1916	265
Embarras river (SW. 5-52-18-5): discharge measurements, in 1916	78

	Page
English ditch from East branch of Lodge creek:	
description	392
discharge measurements, in 1916	393
daily gauge height and discharge, for 1916	393
monthly discharge, for 1916	393
Equivalents:	
list of convenient	20
Etzikom coulee near Goddard:	
description	376
discharge measurements, in 1916	376
daily gauge height and discharge, for 1916	376
monthly discharge, for 1916	377
Etzikom coulee near Stirling:	
description	373
discharge measurements, in 1916	374
daily gauge height and discharge, for 1916	374
monthly discharge, for 1916	375
F	
Fairwell creek at Drury's ranch:	
description	449
discharge measurements, in 1916	449
daily gauge height and discharge, for 1916	450
monthly discharge, for 1916	451
historic summary	452
Fauquier ditch from Hay creek:	
description	533
discharge measurements, in 1916	533
daily gauge height and discharge, for 1916	534
Fearon ditch from Piapot creek:	
description	526
Fiddle river (SE. 15-40-27-3):	
discharge measurements, in 1916	78
Fidler Bros.' ditch from Boundary creek:	
description	324
Findlay and McDougal ditch from Highwood river:	
description	227
discharge measurements, in 1916	227
daily gauge height, for 1916	227
Fireguard creek (SE. 5-3-11-3):	
discharge measurements, in 1916	490
Fish creek near Friddis:	
description	207
discharge measurements, in 1916	207
daily gauge height and discharge, for 1916	208
monthly discharge, for 1916	209
historic summary	210
Fish creek, North branch (NE. 22-22-3-5):	
discharge measurements, in 1916	245
Fish creek, South branch (NE. 22-22-3-5):	
discharge measurements, in 1916	245
Fornfeist ditch near St. Kilda:	
description	369
Fortymile creek near Banff:	
description	165
discharge measurements, in 1916	165
daily gauge height and discharge, for 1916	166
monthly discharge, for 1916	167
historic summary	168
Frenchman river drainage basin:	
general description	433
miscellaneous discharge measurements, 1916	490
Frenchman river near Belanger:	
description	441
discharge measurements, in 1916	441
daily gauge height and discharge, for 1916	442
monthly discharge, for 1916	442
Frenchman river at East End:	
description	460
discharge measurements, in 1916	461
daily gauge height and discharge, for 1916	461
monthly discharge, for 1916	462
historic summary	463
Frenchman river at Martin's ranch:	
description	479
discharge measurements, in 1916	479
daily gauge height and discharge, for 1916	480
monthly discharge, for 1916	481
Frenchman river at Phillips' ranch:	
description	456
discharge measurements, in 1916	457
daily gauge height and discharge, for 1916	457
monthly discharge, for 1916	458
historic summary	459
Frenchman river at "76" ranch:	
description	468
discharge measurements, in 1916	468
daily gauge height and discharge, for 1916	469
monthly discharge, for 1916	470

	Page
Frenchman river, North branch of, at F. Cross' ranch:	
description	453
discharge measurements, in 1916	453
daily gauge height and discharge, for 1916	454
monthly discharge, for 1916	455
historic summary	456
Future work:	19

G

Gaff ditch from Battle creek:	
description	423
Gap creek at Small's ranch:	
description	537
discharge measurements, in 1916	537
daily gauge height and discharge, for 1916	538
monthly discharge, for 1916	539
historic summary	540
Gap creek (NE. 28-11-26-3):	
discharge measurements, in 1916	547
Gap creek (SE. 30-11-26-3):	
discharge measurements, in 1916	547
Gauging stations:	
description of	25
Ghost river at Gillies' ranch:	
description	186
discharge measurements, in 1916	187
daily gauge height and discharge, for 1916	187
monthly discharge, for 1916	188
historic summary	189
Gilchrist Brothers' ditch from Battle creek:	
description	428
Gold creek (NE. 30-7-3-5):	
discharge measurements, in 1916	302
Gordon, Ironsides and Fares' ditch from Skull creek:	
description	520
Grand Valley creek (SW. 24-26-5-5):	
discharge measurements, in 1916	245
Gregg (W. B.) ditch from Middle creek:	
description	406

H

Hammond (D. A.) ditch from Lodge creek:	
description	401
Hammond East ditch from East branch of Hay creek:	
description	530
Hammond West ditch from East branch of Hay creek:	
description	529
Hanckel ditch near Eagle Butte:	
see Roth ditch.	
Happy creek (SE. 14-51-25-5):	
discharge measurements, in 1916	78
Hardisty creek (SE. 24-51-25-5):	
discharge measurements, in 1916	78
Harmon (North Heart) river at Peace river:	
description	34
discharge measurements, in 1916	34
daily gauge height and discharge, for 1916	35
monthly discharge, for 1916	36
Hartt (J. R.) ditch from Lodge creek:	
description	399
Hastings creek near Tofield:	
description	115
discharge measurements, in 1916	115
daily gauge height and discharge, for 1916	116
monthly discharge, for 1916	117
Hay lake drainage basin:	
general description	529
Hay creek at Hay Creek School:	
description	530
discharge measurements, in 1916	530
daily gauge height and discharge, for 1916	531
monthly discharge, for 1916	532
historic summary	533
Heart river (SW. 31-75-16-5):	
discharge measurement, in 1916	78
Henry (F. W.) ditch from Battle creek:	
description	423
Henry ditch from Halfway coulee:	
description	424
discharge measurements, in 1916	424
daily gauge height and discharge, for 1916	424
monthly discharge, for 1916	424

SESSIONAL PAPER No. 25b

	Page		Page
Highwood river near Aldersyde:		Lee creek at Layton's ranch:	
description	233	description	339
discharge measurements, in 1916	233	discharge measurements, in 1916	339
daily gauge height and discharge, for 1916	234	daily gauge height and discharge, for 1916	340
monthly discharge, for 1916	235	monthly discharge, for 1916	341
historic summary	236	historic summary	342
Highwood river at Brown's ranch:		Lesser Slave lake at Grouard:	
description	219	description	71
discharge measurements, in 1916	219	daily gauge height, for 1916	71
daily gauge height and discharge, for 1916	220	Lesser Slave lake near Sawridge:	
monthly discharge, for 1916	221	description	71
Highwood river at High river:		daily gauge height, for 1916	72
description	231	Lesser Slave river at Sawridge:	
discharge measurements, in 1916	231	description	72
daily gauge height and discharge, for 1916	232	discharge measurements, in 1916	73
monthly discharge, for 1916	232	daily gauge height and discharge, for 1916	73
historic summary	233	monthly discharge, for 1916	74
Hooper and Huckvale North ditch:		Lewis ditch at Klintonel:	
description	379	description	499
discharge measurements, in 1916	380	Lindner ditch from Battle creek:	
daily gauge height and discharge, for 1916	380	description	419
monthly discharge, for 1916	381	daily gauge height and discharge, for 1916	419
Hooper and Huckvale South ditch from Manyberries creek:		monthly discharge, for 1916	420
description	385	Link East ditch, North branch, from Dry coulee:	
Horse creek near Barnard, Montana, U.S.A.:		description	402
description	484	Link East ditch, South branch, from Dry coulee:	
discharge measurements, in 1916	484	description	402
daily gauge height and discharge, for 1916	485	Link West ditch, from Dry coulee:	
monthly discharge, for 1916	486	description	402
Horse creek (NE. 8-26-4-5):		Little Bow ditch from Highwood river:	
discharge measurements, in 1916	245	description	228
Huff ditch near Cowley:		discharge measurements, in 1916	228
description	264	daily gauge height and discharge, for 1916	229
I		monthly discharge, for 1916	230
Ice:		historic summary	231
formation of, and conditions	29	Little Bow river drainage basin:	
Introduction:	7	general description	245
Investigations:		Littlebreed creek near Buzzard's ranch:	
special, during 1916	17	description	477
Irrigation creek near Jacques' ranch:		discharge measurements, in 1916	477
description	377	daily gauge height and discharge, for 1916	478
discharge measurements, in 1916	378	monthly discharge, for 1916	478
daily gauge height and discharge, for 1916	378	Little Pinto creek (SE. 2-4-12-3):	
monthly discharge, for 1916	379	discharge measurements in 1916	490
J		Little Red river:	
Jahn (B. A.) ditch from Middle creek:		see Spruce river.	
description	406	Lobstick river near Entwistle:	
Jasper District:		description	65
summary of work, in 1916	16	discharge measurements, in 1916	65
Jones Creek at Stearns' ranch:		daily gauge height and discharge, for 1916	66
description	495	monthly discharge, for 1916	67
discharge measurements, in 1916	495	Lodge creek drainage basin:	
Jumpingpound creek near Jumping Pound:		general description	392
description	189	miscellaneous discharge measurements, in 1916	413
discharge measurements, in 1916	189	Lodge creek at Hartt's ranch:	
daily gauge height and discharge, for 1916	190	description	399
monthly discharge, for 1916	191	historic summary	400
historic summary	192	Lodge creek at Willow Creek Police Detachment:	
K		description	410
Kananaskis river near Seebe:		discharge measurements, in 1916	411
description	183	daily gauge height and discharge, for 1916	411
discharge measurements, in 1916	183	monthly discharge, for 1916	412
daily gauge height and discharge, for 1916	184	historic summary	413
monthly discharge, for 1916	185	Lodge creek (NE. 25-3-1-1):	
historic summary	186	discharge measurements, in 1916	413
Ketchum creek at Pickett's ranch:		Lodge creek (NW. 10-6-3-4):	
description	385	discharge measurements, in 1916	413
discharge measurements, in 1915 and 1916	385	Lodge creek (SW. 15-6-3-4):	
daily gauge height and discharge, for 1915	386	discharge measurements, in 1916	413
daily gauge height and discharge, for 1916	387	Lodge creek, East branch, at English's ranch:	
monthly discharge, for 1915-1916	388	description	393
L		discharge measurements, in 1916	394
Lake Johnston drainage basin:		daily gauge height and discharge, for 1916	394
general description of	508	monthly discharge, for 1916	395
Lake Louise, tailrace of power house (NE. 20-28-16-5):		Long creek near Estevan:	
discharge measurements, in 1916	245	description	585
Lake of the Narrows drainage basin:		discharge measurements, in 1916	586
general description	517	daily gauge height and discharge, for 1916	586
Lake Wabamum at Wabamum:		monthly discharge, for 1916	587
description	105	historic summary	588
daily gauge height, for 1916	105	Louise creek near Lake Louise:	
		description	162
		discharge measurements, in 1916	162
		daily gauge height and discharge, for 1916	163
		monthly discharge, for 1916	164
		Low velocity limitations:	25
		Lynch (NL) ditch from Lodge creek:	
		description	401
		Lyons creek (NE. 35-7-4-5):	
		discharge measurements, in 1916	302

M	Page
Mackay creek at Walsh:	
description	518
discharge measurements, in 1916	518
daily gauge height and discharge, for 1916	519
monthly discharge, for 1916	550
historic summary	551
Mackay creek, East branch (NW. 14-11-1-4):	
description	555
Mackay creek, West branch (NW. 14-11-1-4):	
description	555
Macleod District:	
summary of work in 1916	9
Maligne river near Jasper:	
description	49
discharge measurements, in 1916	49
daily gauge height and discharge, for 1916	50
monthly discharge, for 1916	50
Maligne river above Gorge:	
discharge measurement, in 1916	78
Mami creek at Mountain View:	
description	318
discharge measurements, in 1916	318
daily gauge heights and discharges, for 1916	319
monthly discharge, for 1916	320
historic summary	321
Mann ditch from Skull creek:	
description	520
Manyberries creek at Hooper and Huckvale's ranch:	
description	382
discharge measurements, in 1916	382
daily gauge height and discharge, for 1916	383
monthly discharge, for 1916	384
Manyberries creek, South branch (SW. 7-5-5-4):	
discharge measurements, in 1916	389
Many Island lake drainage basin:	
general description	547
miscellaneous discharge measurements, in 1916	555
Maple creek at Dixon's ranch:	
description	544
discharge measurements, in 1916	544
daily gauge height and discharge, for 1916	545
monthly discharge, for 1916	546
Maple Creek Cattle Company ditch from Oxarat creek:	
description	434
daily gauge height and discharge, for 1916	435
monthly discharge, for 1916	435
Maple Creek District:	
summary of work, for 1916	13
Maple creek near Maple Creek:	
description	541
discharge measurements, in 1916	542
daily gauge height and discharge, for 1916	542
monthly discharge, for 1916	543
historic summary	544
Marshall and Gaff ditch from Battle creek:	
description	423
Martin creek near Nordegg:	
description	85
discharge measurements, in 1916	86
daily gauge height and discharge, for 1916	86
monthly discharge, for 1916	87
McCarthy, Bertram and Salt East ditch from Bear creek:	
description	525
McCarthy, Bertram and Salt West ditch from Bear creek:	
description	525
McEachran creek at McCoy's ranch:	
description	481
discharge measurements, in 1916	482
daily gauge height and discharge, for 1916	482
monthly discharge, for 1916	483
McEachran creek, East branch, at McCoy's ranch:	
description	483
discharge measurements, in 1916	483
daily gauge height and discharge, for 1916	484
McGillivray creek near Coleman:	
description	254
discharge measurements, in 1916	254
McKinnon (J.) ditch from Battle creek:	
description	428
McLeod river near Thornton:	
description	59
discharge measurements, in 1916	59
daily gauge height and discharge, for 1916	60
monthly discharge, for 1916	61
McShane creek (SE. 4-10-27-3):	
discharge measurements, in 1916	547
Mean discharge:	
monthly	27

	Page
Mean velocity:	
methods of measuring	24
vertical velocity curve method of determining	24
three-point method of determining	24
two-point method of determining	24
single-point method of determining	24
integration method of determining	24
Midd e creek (SW. 35 5-1-1):	
discharge measurements, in 1916	413
Midd e creek at Hammond's ranch:	
description	407
discharge measurements, in 1916	407
daily gauge height and discharge, for 1916	408
monthly discharge, for 1916	409
historic summary	410
Midd e creek at Ross' ranch:	
description	403
discharge measurements, in 1916	403
daily gauge height and discharge, for 1916	404
monthly discharge, for 1916	405
historic summary	406
Miette river near Jasper:	
description	43
discharge measurements, in 1916	44
daily gauge height and discharge, for 1916	44
monthly discharge, for 1916	45
Milk river drainage basin:	
general description	357
Milk river at Milk River:	
description	365
discharge measurements, in 1916	365
daily gauge height and discharge, for 1916	366
monthly discharge, for 1916	367
historic summary	368
Milk river at Pendant d'Oreille Police Detachment:	
description	369
discharge measurements, in 1916	370
historic summary	370
Milk river at Spencer's Lower ranch:	
description	370
discharge measurements, in 1916	371
daily gauge height and discharge, for 1916	371
monthly discharge, for 1916	372
historic summary	373
Milk river at Writing-on-Stone Police Detachment:	
description	368
historic summary	368
Milk river, North branch of, at Peter's ranch:	
description	358
discharge measurements, in 1916	358
daily gauge height and discharge, for 1916	359
monthly discharge, for 1916	360
historic summary	361
Milk river, South branch of, at Croff's ranch:	
description	361
discharge measurements, in 1916	361
daily gauge height and discharge, for 1916	362
monthly discharge, for 1916	363
historic summary	364
Milk river, South branch of, at Mackie's ranch:	
description	364
discharge measurements, in 1916	364
historic summary	364
Mill creek near Mountain Mill:	
description	278
discharge measurements, in 1916	278
daily gauge height and discharge, for 1916	279
monthly discharge, for 1916	280
historic summary	281
Mire creek near Saunders:	
see Shunda creek	
Mistaya river near mouth of stream:	
description	79
discharge measurements, in 1916	80
Mitchell (Wm.) Lower ditch near Thelma:	
description	401
Mitchell (Wm.) Upper ditch from Lodge creek:	
description	400
Moek (A. F.) ditch near Thelma:	
description	402
Montagneuse river (NW. 31-83-6-6):	
discharge measurement, in 1916	43
Moorhead ditch from Flapot creek:	
description	526
Moosajaw creek drainage basin:	
general description	574
Moosajaw creek near Lang:	
description	574
discharge measurements, in 1916	575
daily gauge height and discharge, for 1916	575
monthly discharge, for 1916	576
historic summary	577

	Page
Moosejaw creek at McCarthy's farm:	
description	577
discharge measurements, in 1916	577
daily gauge height and discharge, for 1916	578
monthly discharge, for 1916	579
historic summary	580
Moose Mountain creek near Oxbow:	
description	591
discharge measurements, in 1916	591
daily gauge height and discharge, for 1916	592
monthly discharge, for 1916	593
Morrison Brothers' ditch from Frenchman river:	
description	463
Mosquito creek near Nanton:	
description	245
discharge measurements, in 1916	246
daily gauge height and discharge, for 1916	246
monthly discharge, for 1916	247
historic summary	248
Muddypound creek at Hart's ranch:	
description	292
discharge measurements, in 1916	292
daily gauge height and discharge, for 1916	293
monthly discharge, for 1916	294
historic summary	295
Mudie ditch from Sexton creek:	
description	396
Muir and Frantz ditch from Middle creek:	
description	402
Mule creek at Gunn's ranch:	
description	463
discharge measurements, in 1916	464
daily gauge height and discharge, for 1916	464
monthly discharge, for 1916	465
Mull (F. L.) East ditch near coulee:	
description	419
Mull (F. L.) West ditch near Coulee:	
description	418
Muskeg creek (NW 17-66-22-4):	
discharge measurements, in 1916	78
Muskeg creek (SW 15-54-16-5):	
discharge measurement, in 1916	78
N	
Nanton creek near Nanton:	
description	248
discharge measurements, in 1916	248
daily gauge height and discharge, for 1916	249
monthly discharge, for 1916	249
historic summary	250
Needham Brothers' ditch from Bear creek:	
description	524
discharge measurements, in 1916	524
daily gauge height and discharge, for 1916	524
Nez Perce creek (NW 17-84-5):	
discharge measurements, in 1916	302
Nordegg District:	
summary of work, in 1916	15
report on, by O. H. Hoover	15
North branch of Fish creek:	
see Fish creek.	
North branch of Frenchman river:	
see Frenchman river.	
North branch of Milk river:	
see Milk river.	
North branch of Sheep river:	
see Sheep river.	
North Heart river:	
see Harmon river.	
North Saskatchewan river drainage basin:	
general description	79
miscellaneous discharge measurements, in 1916	136
North Saskatchewan river at Battleford:	
description	118
discharge measurements of North channel, in 1916	118
daily gauge height and discharge of North channel, for 1916	119
monthly discharge of North channel, for 1916	120
discharge measurements of South channel, for 1916	121
daily gauge height and discharge of South channel, for 1916	121
monthly discharge of South channel, for 1916	122
historic summary	123

N

	Page
North Saskatchewan river at Edmonton:	
description	106
discharge measurements, in 1916	106
daily gauge height and discharge, for 1916	107
monthly discharge, for 1916	108
historic summary	109
North Saskatchewan river at Prince Albert:	
description	132
discharge measurements, in 1916	132
daily gauge height and discharge, for 1916	133
monthly discharge, for 1916	134
historic summary	135
North Saskatchewan river near Rocky Mountain House:	
description	97
discharge measurements, in 1916	97
daily gauge height and discharge, for 1916	98
monthly discharge, for 1916	99
historic summary	100
North Saskatchewan river at Rocky Rapids:	
description	102
discharge measurements, in 1916	102
daily gauge height and discharge, for 1916	103
monthly discharge, for 1916	104
North Saskatchewan river near Saunders:	
description	91
discharge measurements, in 1916	91
daily gauge height and discharge, for 1916	92
monthly discharge, for 1916	93
North Saskatchewan river at Wilson's ranch:	
description	81
discharge measurements, in 1916	81
daily gauge height and discharge, for 1916	82
monthly discharge, for 1916	83
Nose creek near Calgary:	
description	202
discharge measurements, in 1916	202
daily gauge height and discharge, for 1916	203
monthly discharge, for 1916	204
historic summary	205
Notukeu creek near Vanguard:	
description	568
discharge measurements, in 1916	568
daily gauge height and discharge, for 1916	569
monthly discharge, for 1916	570
O	
Office computations	25
Office work:	
summary of, in 1916	17
Oldman river drainage basin:	
general description	250
miscellaneous discharge measurements, in 1916	302
Oldman river near Cowley:	
description	268
discharge measurements, in 1916	268
daily gauge height and discharge, for 1916	269
monthly discharge, for 1916	270
historic summary	271
Oldman river near Lethbridge:	
description	298
discharge measurements, in 1916	298
daily gauge height and discharge, for 1916	299
monthly discharge, for 1916	301
historic summary	301
Oldman river near Macleod:	
description	287
discharge measurements, in 1916	287
daily gauge height and discharge, for 1916	288
monthly discharge, for 1916	289
historic summary	290
Organization:	
in 1916	7
Oxart creek at Wylie's ranch:	
description	435
discharge measurements, in 1916	436
daily gauge height and discharge, for 1916	436
monthly discharge, for 1916	437
historic summary	438
P	
Pakowki lake drainage basin:	
general description	373
miscellaneous discharge measurements, in 1916	389
Parsonage (J. E.) ditch near Battle Creek:	
description	419

O

P

SESSIONAL PAPER No. 25a

S	Page		Page
Sandy creek near Caron:		Snake creek, East branch (NW. 21-4-12-3):	
description	580	discharge measurements, in 1916	490
discharge measurements, in 1916	580	Snake Indian (Stony) river near Hawes:	
daily gauge height and discharge, for 1916	581	description	54
monthly discharge, for 1916	582	discharge measurements, in 1916	54
Sage creek drainage basin:		daily gauge height and discharge, for 1916	55
general description	389	monthly discharge, for 1916	55
Sage creek at Wild Horse Police Detachment:		Snaring river (NW. 33-46-1-6):	
description	389	discharge measurements, in 1916	78
discharge measurements, in 1916	390	Souris river drainage basin:	
daily gauge height and discharge, for 1916	390	general description	584
monthly discharge, for 1916	391	Souris river near Estevan:	
Saskatoon District:		description	588
summary of work, for 1916	14	discharge measurements, in 1916	588
Saunders creek (Sec. 24-40-13-5):		daily gauge height and discharge, for 1916	589
discharge measurement, in 1916	136	monthly discharge, for 1916	590
Second-foot (Sec.-ft.):		historic summary	591
definition of	19	Souris river near Glen Ewen:	
sec.-ft. per square mile, definition of	20	description	593
Scope of work:	7	discharge measurements, in 1916	594
Sevenpersons river drainage basin:		daily gauge height and discharge for 1916	594
general description	565	monthly discharge, for 1916	595
Sevenpersons river at Medicine Hat:		historic summary	596
description	566	Souris river at Weyburn:	
discharge measurements, in 1916	566	description	584
daily gauge height and discharge, for 1916	566	discharge measurements, in 1916	584
monthly discharge, for 1916	567	daily gauge height and discharge, for 1916	585
Sexton creek (SW. 21-7-3-4):		monthly discharge, for 1916	585
discharge measurements, in 1916	413	see Blackstone river.	
Sheep river near Okotoks:		South branch of Fish creek:	
description	216	see Fish creek.	
discharge measurements, in 1916	216	South branch of Manyberries creek:	
daily gauge height and discharge, for 1916	217	see Manyberries creek.	
monthly discharge, for 1916	218	South branch of Milk river:	
historic summary	219	see Milk river.	
Sheep river, North branch, near Millarville:		South branch of Sheep river:	
description	210	see Sheep river.	
discharge measurements, in 1916	210	Southeast river:	
daily gauge height and discharge, for 1916	211	description	100
monthly discharge, for 1916	212	South Saskatchewan river drainage basin:	
historic summary	213	general description	146
Sheep river, South branch, at Black Diamond:		South Saskatchewan river at Medicine Hat:	
description	213	description	146
discharge measurements, in 1916	213	discharge measurements, in 1916	147
daily gauge height and discharge, for 1916	214	daily gauge height and discharge, for 1915	147
monthly discharge, for 1916	215	monthly discharge, for 1915	148
historic summary	216	historic summary	149
Sheep river:		South Saskatchewan river at Saskatoon:	
see also Ram river.		description	149
Shotgun creek (NW. 21-4-14-3):		discharge measurements, in 1916	149
discharge measurements, in 1916	490	daily gauge height and discharge for 1916	150
Shunda (Mire) creek near Saunders:		monthly discharge, for 1916	152
description	88	historic summary	152
discharge measurements, in 1916	88	Spangler (M., M. M., & J. M.) ditch from Lodge	
daily gauge height and discharge, for 1916	89	creek:	
monthly discharge, for 1916	90	description	401
Siffleur river near Wilson's ranch:		Spangler ditch from Sixmile coulee:	
description	80	description	414
discharge measurements, in 1916	80	Spencer creek (SE. 18-26-5-5):	
Sinclair South ditch near Gull Lake:		discharge measurements in 1916	245
description	496	Spirit river (NW. 12-7S-6-6):	
Sixmile coulee at Spangler's ranch:		discharge measurement, in 1916	43
description	415	Spray creek at Spray lakes:	
discharge measurements, in 1916	415	description	173
daily gauge height and discharge, for 1916	416	discharge measurements, in 1916	173
monthly discharge, for 1916	417	daily gauge height and discharge, for 1916	173
Sixmile creek (Sec. 12-8-29-3):		monthly discharge, for 1916	174
discharge measurement, in 1916	433	Spray river near Banff:	
Skull creek at Doyle's ranch:		description	174
description	517	discharge measurements, in 1915	174
discharge measurements, in 1916	517	daily gauge height and discharge, for 1915	175
daily gauge height and discharge, for 1916	518	monthly discharge, for 1915	176
monthly discharge, for 1916	519	historic summary	177
historic summary	520	Spray river near Spray lakes:	
Small (Wm.) ditch from McShane creek:		description	171
description	540	discharge measurements, in 1916	171
discharge measurements, in 1916	540	daily gauge height and discharge, for 1916	172
daily gauge height and discharge, for 1915	541	monthly discharge, for 1916	172
monthly discharge, for 1916	541	Spring near Caron:	
Smoky river at Prudent's Crossing:		description	583
description	31	discharge measurements, in 1916	583
discharge measurements, in 1916	32	daily gauge height and discharge, for 1916	583
daily gauge height and discharge, for 1916	32	Spring creek near Wynyard:	
monthly discharge, for 1916	33	description	596
Snake creek near Val Marie:		discharge measurements, in 1916	596
description	470	daily gauge height and discharge, for 1916	597
discharge measurements, in 1916	471	monthly discharge, for 1916	598
daily gauge height and discharge, for 1916	471	Spring coulee (SE. 8-11-23-3):	
monthly discharge, for 1916	472	discharge measurements, in 1916	529
daily gauge height and discharge, for 1915	473	Spruce (Little Red) river near Prince Albert:	
monthly discharge, for 1915	474	description	135
		discharge measurements, in 1916	135

Wood and Anderson ditch near Coulee: description.....	Page 418
Wood and Anderson South ditch from White Mud coulee: description.....	418
Wood and Anderson North ditch from White Mud coulee: description	418
Y	
York creek (NW. 34-7-4-5): discharge measurements, in 1916	302

IRRIGATION BRANCH
LIST OF PUBLICATIONS

ANNUAL STREAM MEASUREMENT REPORT—1909 to 1916.

ANNUAL IRRIGATION REPORT—1906 to 1915.

IRRIGATION SURVEYS AND INSPECTIONS REPORT—1915 (1915-16).

WESTERN CANADA IRRIGATION ASSOCIATION REPORT—(1st to 10th Convention).

INTERNATIONAL IRRIGATION CONGRESS REPORT (1914).

BULLETIN No. 1—(Irrigation in Saskatchewan and Alberta).

BULLETIN No. 2—(Alfalfa Culture).

BULLETIN No. 3—(Climatic and Soil Conditions, C.P.R. Irrigation Block).

BULLETIN No. 4—(Duty of Water Experiments and Farm Demonstration Work).

PAMPHLETS:

Address by Mr. S. G. Porter—"Practical Operation of Irrigation Works."—Extract from W.C.I.A. Report, 1914

Address by Dr. Rutherford—"Inter-dependence of Farm and City."—Extract from W.C.I.A. Report, 1914.

Address by Mr. Don. H. Bark—"The Actual Problem that Confronts the Irrigator."—Extract from W.C.I.A. Report, 1914.

Address by Mr. Don. H. Bark—"Practical Irrigation Hints for Alberta"—Extract from W.C.I.A. Report, 1915.

Address by Mr. Don. H. Bark—"Alfalfa Growing."—Extract from W.C.I.A. Report, 1915.

